MODERN PLASTICS

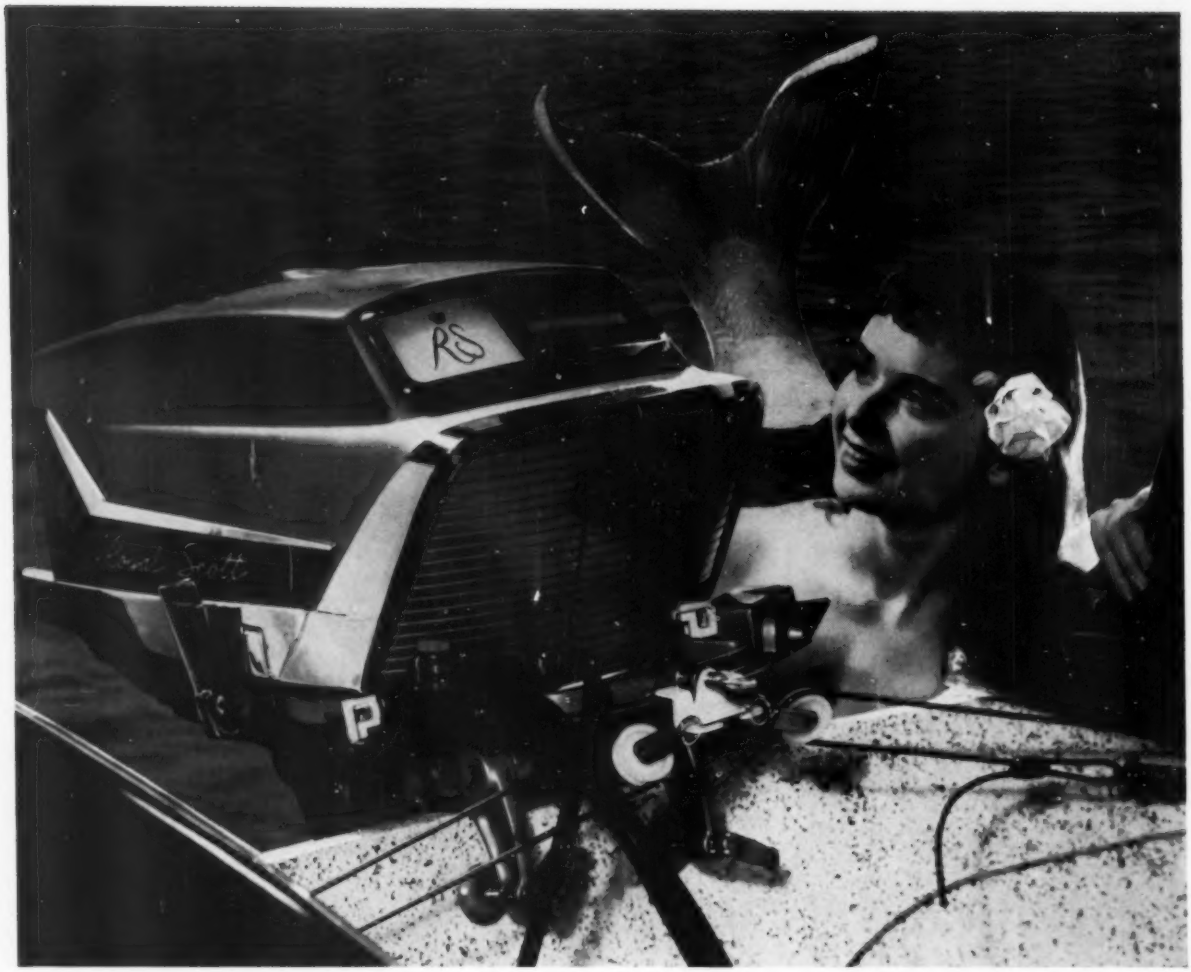
March 1958

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What can you make out of polypropylene—and how? *page 89*

Plastics' stake in toys page 88





Hetron polyester motor hood molded by General Tire & Rubber Co.

Idea man makes big strike using Hetron for bait

The designer of this new Scott-Atwater outboard motor needed a sales hook to intrigue a highly competitive market.

He found *several*—when he chose glass-reinforced Hetron® polyester for the smartly styled motor hood.

Unlike most hoods, this one is dentproof and can't rust. It ignores hard knocks and vibration. Sea spray and salt breezes won't ever corrode it. Sun and motor heat can't hurt it. And it's more soundproof than metal—hushes motor noise to a whisper.

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Should your product have properties like these? You can get them with Hetron. This versatile family of resins includes rigid, semi-rigid, and flexible types. Rigid and semi-rigid types provide inherent fire retardance, without additives. Light weight, outstanding mechanical strength, and low tooling costs are additional advantages.

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PLASTICS DIVISION

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In both extruding and vacuum forming processes, CATALIN STYRENE performs brilliantly . . . and its end-use properties of high-impact strength, dimensional stability, low moisture absorption and good heat and chemical resistance make it an outstanding choice.

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MODERN PLASTICS

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Editorial

Standards take time

An exhibit of standards established by various industries through the National Bureau of Standards was held recently at the Offices of the U. S. Department of Commerce in Washington. Here it was shown that more commodities standards have been established through The Society of the Plastics Industry, Inc., than through any other trade association in this country.

The S.P.I. is to be congratulated on its Standards Program, but the point must be brought home to industry that the establishment of standards is a slow, tedious, and quite expensive effort on the part of a great many industry-minded men.

The first plastics product standard covering polystyrene wall tiles and adhesives for their use became effective on July 15, 1950. It involved three years' effort on the part of fifteen men in the industry. Ten major meetings were held in the course of the development. The next standard, covering heavy-duty melamine tableware, became effective December 15, 1950, after three years of work on the part of fifteen men who attended twenty meetings in that time. A standard on general-purpose vinyl film which became effective May 2, 1953 involved 200 men from the industry working in eleven sub-committees, meeting over a five-year period. A standard for melamine dinnerware for household use established April 1, 1957, involved fifteen men holding six meetings over a three-year period. And a standard for fibrous glass-reinforced polyester corrugated panels, which became effective October 16, 1957, involved twenty-five men who held twenty-five major meetings over a five-year period.

No records of time and effort are available for the five pipe standards, but the above details prove the point.

Currently, various industry committees, under S.P.I. auspices, are working on additional standards for plastics commodities, as follows: shower receptors, bathtubs, polyethylene film, flexible vinyl foam, flexible urethane foam, and rigid foams, as well as on revisions to certain present pipe standards.

This is to suggest to those in the industry who will benefit by the standards that they now stand up and be counted by participating in this work. Many hands, many voices, many brains make the work lighter.

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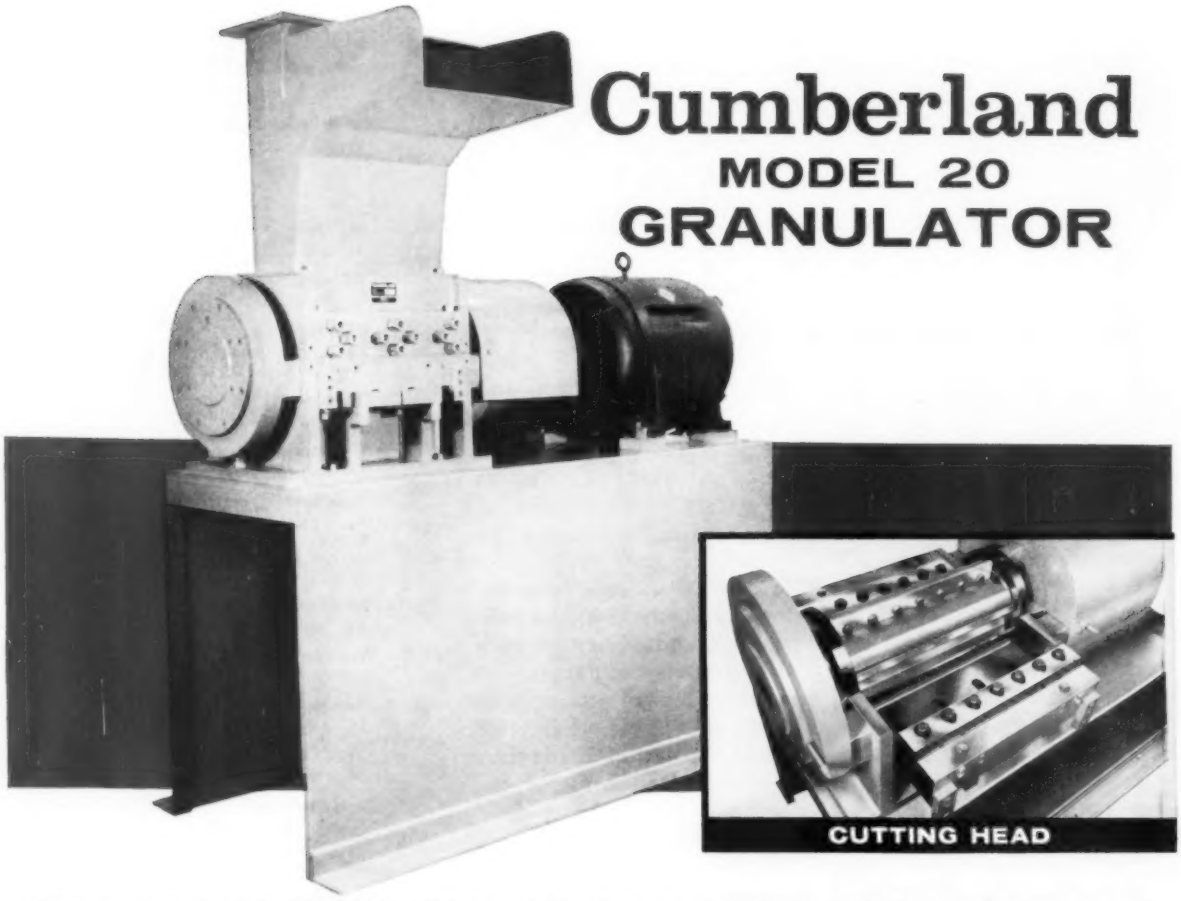
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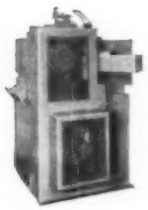
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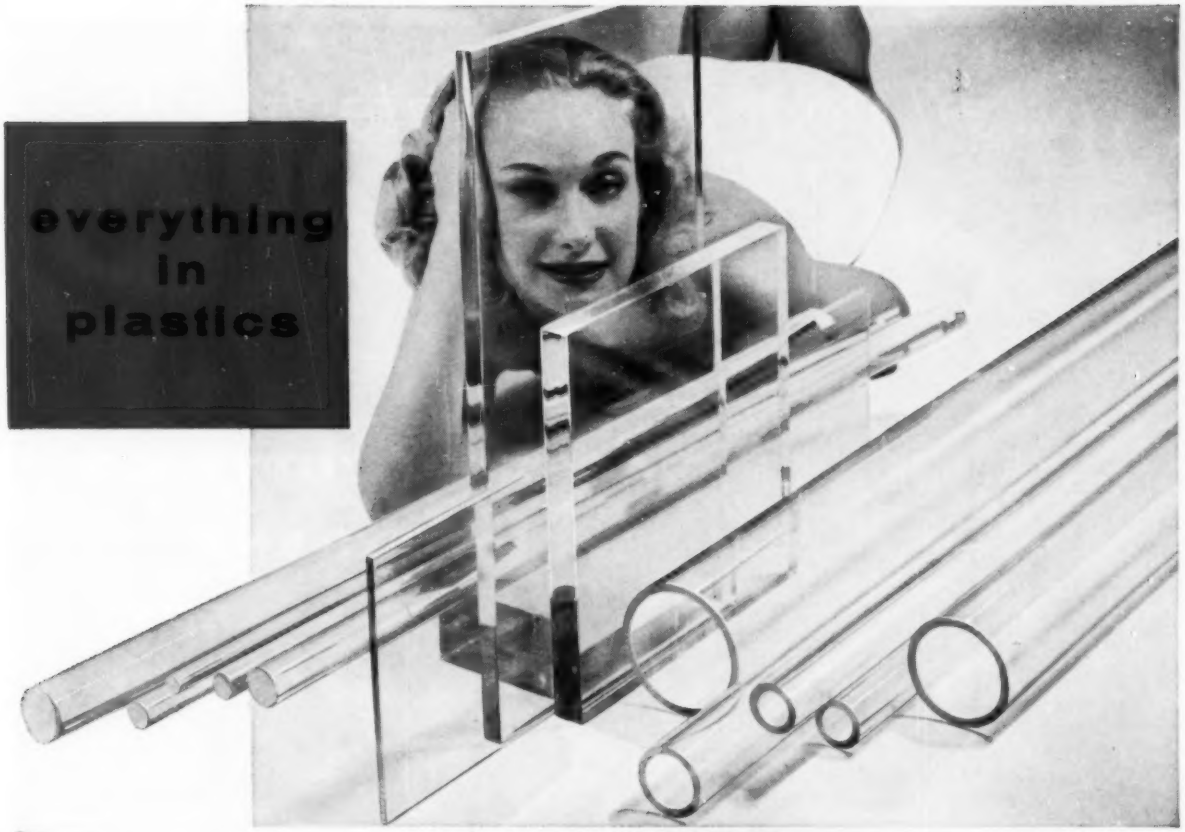


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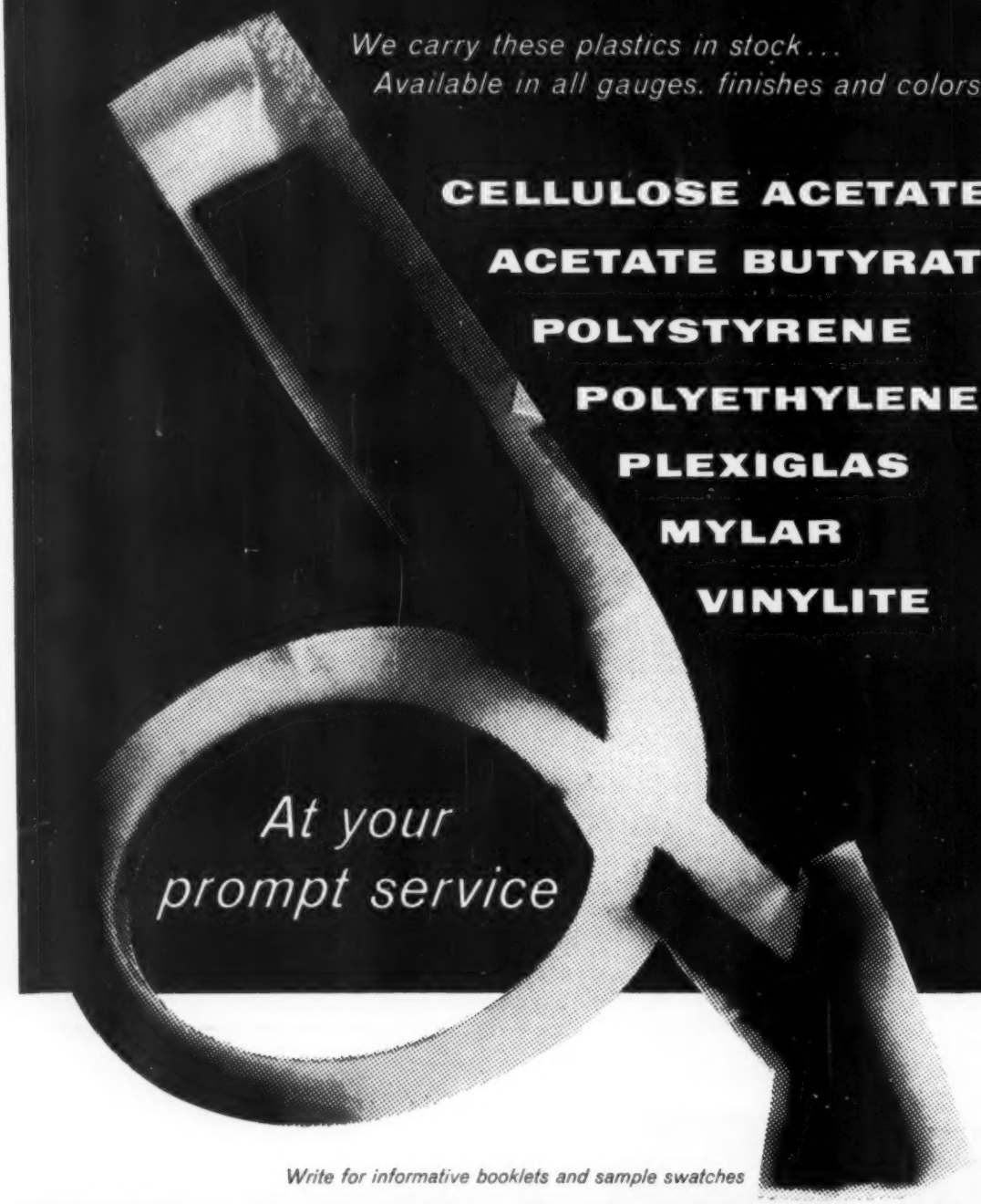
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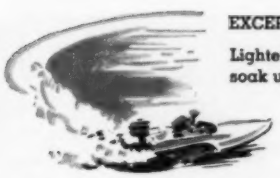
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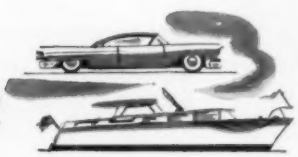


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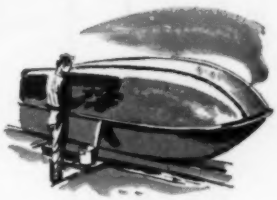
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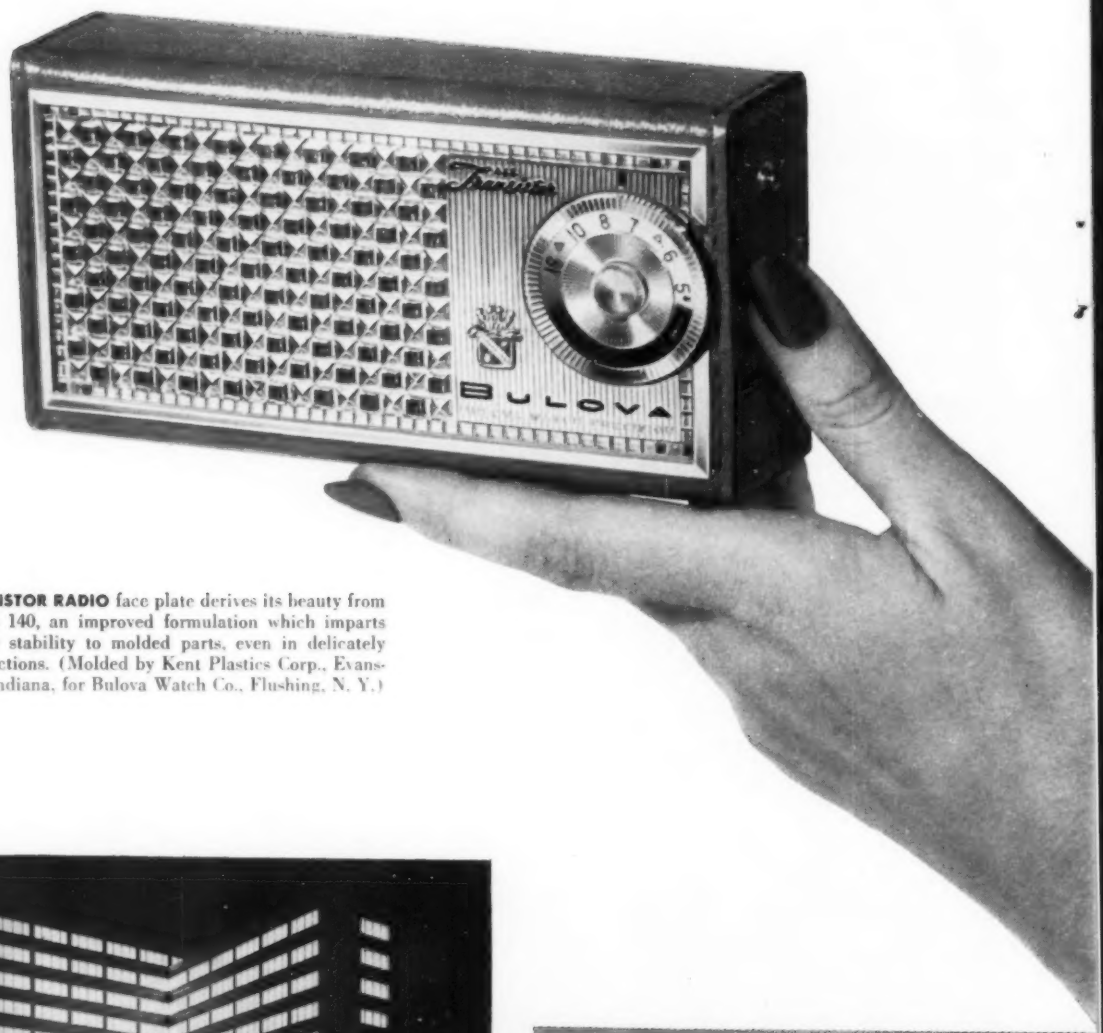
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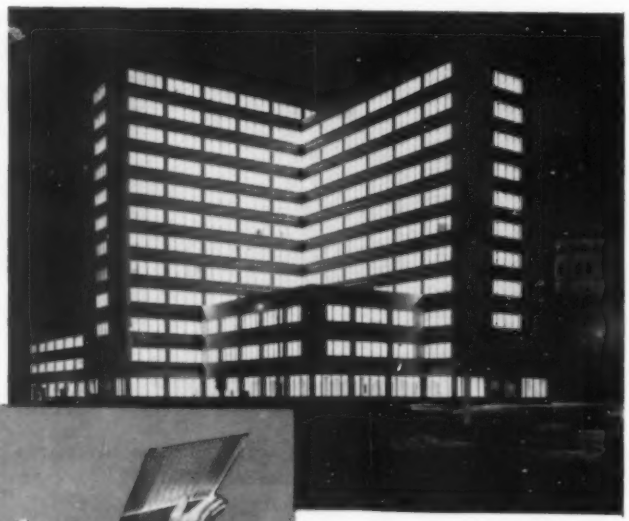
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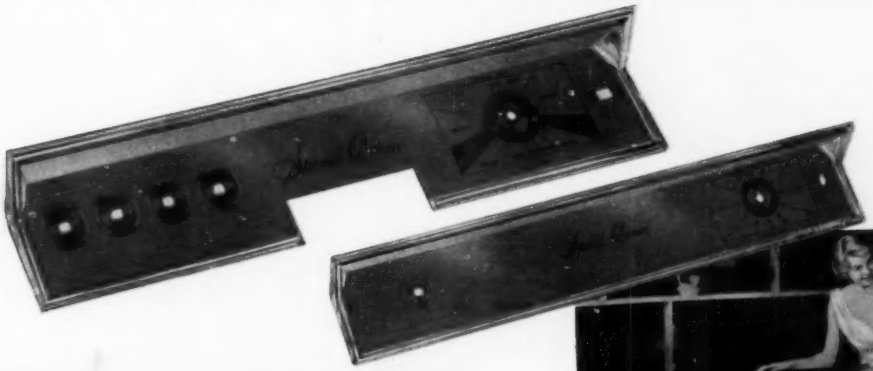


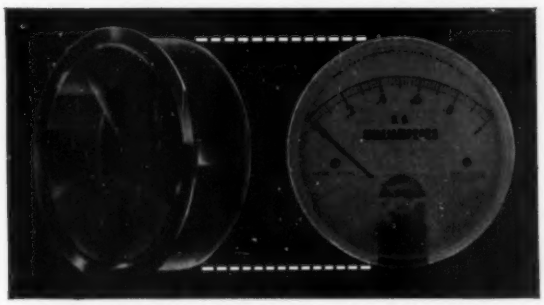
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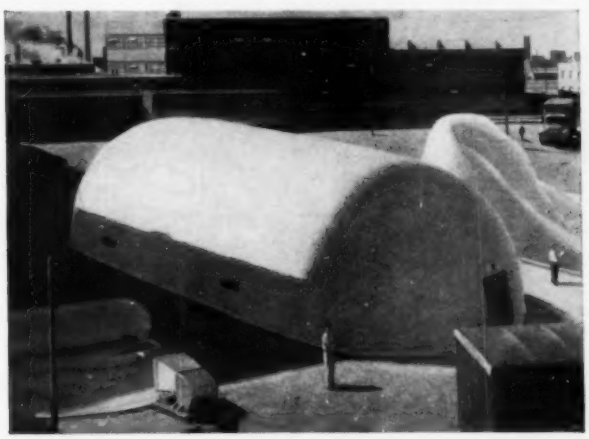
Unusual housing projects rest firmly on fabric!



Vital radar equipment is housed in pressurized radomes of strong rubberized Wellington Sears fabric.



Structure is made by spraying concrete over balloon of rubberized nylon. Nylon base fabric supplied by Wellington Sears.



Welkote, nylon base fabric specifically engineered for vinyl and neoprene coating, is used in inflatable air structure.

A shelter for our continental military defenses, a concrete storage building, an air-supported warehouse—all built with fabric. They represent still another group of new developments in industry made possible by the use of fabric in working combination with plastic, rubber, and other materials.

In housing projects of this kind—and in new irrigation tubing, fuel tanks, belts, hose and other products made through the coating, laminating, combining or frictioning of fabric—Wellington Sears figures importantly. With this experience, and over a century of background in industrial textiles, supplying a wide range of base fabrics for many purposes, Wellington Sears can help solve *your* fabric problem. Call on us, and for informative booklet, "Fabrics Plus," write Dept. K-3.

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For Coated Materials, High and Low Pressure Laminates and Other Reinforced Products

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Photo courtesy Sun Rubber Company, Barberton, Ohio

control in casting

Rotational casting is a fast-growing method of rapidly producing hollow vinyl moldings of high quality at low cost.

A major factor in the success of rotational casting is the formulation of the plastisol. It not only must provide the end properties desired, but must exhibit adequate flow during the fusion cycle.

Close control of gelation is the main reason why a leading toy manufacturer uses PLIOVIC AO in the compound for his lifelike dolls. PLIOVIC AO helps importantly to influence fusion characteristics during the early stages of molding to assure complete and uniform distribution of the charge.

In addition to gelation control, PLIOVIC AO displays several other advantages in casting compounds. It is fully compatible with other materials used. It lowers the fusion temperature. And it improves hot tear strength.

Why not see what you can gain by casting your lot with PLIOVIC AO. Find out how its unique properties improve other dispersions, such as fabric and metal coatings. For full details and outstanding technical service, including the latest *Tech Book Bulletins*, on this and other tailor-made members of the PLIOVIC family, just write to:

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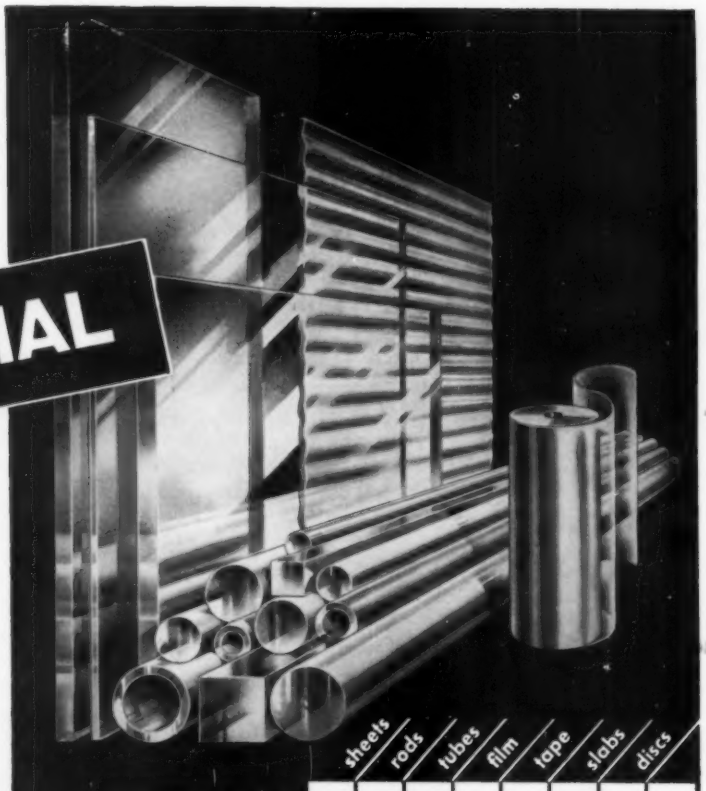
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plastic sheets rods tubes *fast!*



New 64-page Catalog and Price Schedule *Yours...on Request!*

Catalog lists complete specifications, dimensions, colors and prices of industrial and decorative plastic sheets, rods, tubes, etc. — either cast, extruded, molded or laminated. Plastic coatings and fabrication supplies are also included.



	sheets	rods	tubes	film	tape	slabs	discs
PLEXIGLAS	√	√	√				
NYLON	√	√	√	√	√	√	√
TEFLON	√	√	√	√	√	√	
VINYLITE	√	√	√				
ACETATE	√	√	√	√			
POLYSTYRENE	√	√	√			√	√
POLYETHYLENE	√	√	√	√		√	
PHENOLIC LAMINATES	√	√	√				

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630 Broadway, New York 12, N. Y.
Gentlemen:

Please send the following . . .

- ☐ 64-pg. Catalog & Price Schedule "Plastics for Industry"
- ☐ "Sq. Ft. Converter Chart" for sheets up to 67" x 102"
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Company_____



PHONE: GRamercy 7-5000

COMMERCIAL PLASTICS AND SUPPLY CORP.
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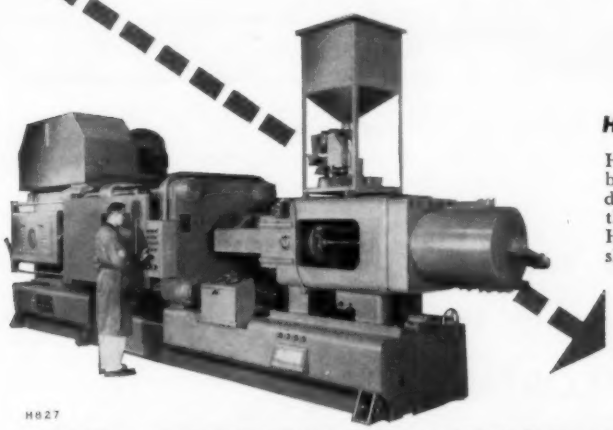
Branch Warehouses: Newark, N. J., 170 Malverne St. • Pittsburgh, Pa., 119-9th St. • Miami, Fla., 3801 N.W. 2nd Ave.

You Can Bank On H-P-M'S "48/64"

Tops For Big Polyethylene Parts



These big polyethylene waste baskets are typical of the big area, deep parts being molded on H-P-M's new Model 800-H-48 injection machine. This waste basket is molded in less than a minute. "Yes, the H-P-M "48" has everything," reports one molding superintendent . . . large injection plunger diameter to accommodate full capacity "shots" . . . plenty of stroke . . . large mold area. It's fast with straight line hydraulic mold clamp . . . high injection speeds . . . and plasticizing capacity for big parts at exceedingly high rates of speed.



Here's good news!

High speed H-P-M "48/64's" are now being built on stock orders that will assure excellent deliveries. Growing market demands have made the H-P-M 48 oz. a real favorite. See your H-P-M field engineer today—get your shop in shape for bigger, better, faster production.

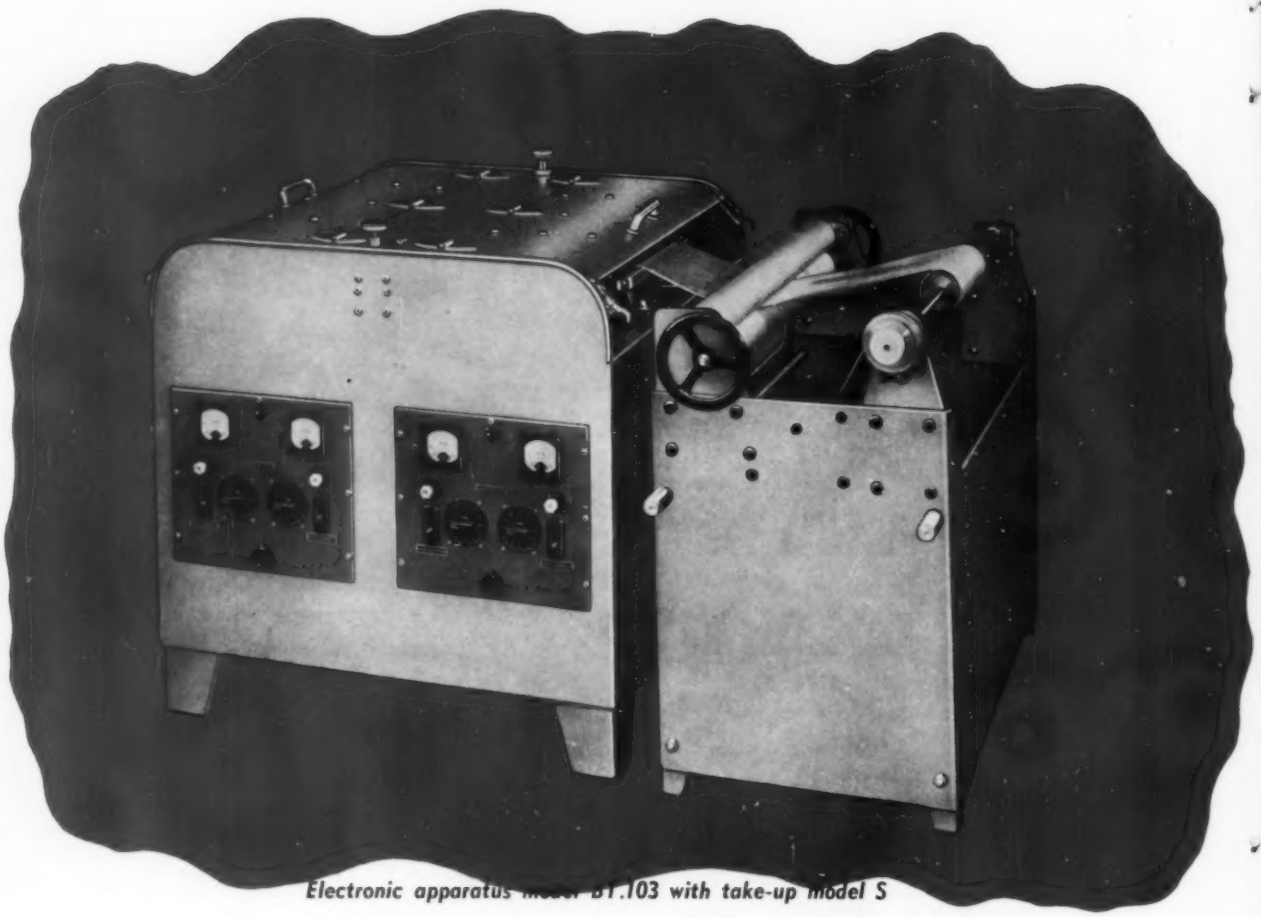
H827

THE HYDRAULIC PRESS MFG. COMPANY

A DIVISION OF KOEHRING COMPANY • MOUNT GILEAD, OHIO, U. S. A.

HPM

INDELIBLE PRINTING ON POLYETHYLENE



Electronic apparatus model BT.103 with take-up model S

Pre-treatment for printing Polyethylene Film and Tube.

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Cables: SCAEVENDI—FIRENZE



"fisheyes" in finished products can be caused by any one (or combination) of several factors. Dirt, fibers, cross-contamination with another resin, or gelling of the actual resin itself. That's why the sensible way to combat this problem is, first of all, to select a superior PVC resin. A resin—in this case—such as Irvinil 620, a medium molecular weight polymer specially designed for calendering operations.

Irvinil 620's superiority comes from the extreme care taken in its manufacture. Continuous close inspection, as a case in point, directly *eliminates* the fisheye causatives—coarse particles and horny polymer. As a result, a free-flowing powder is produced which gives you *uniform* porosity and *high* plasticizer absorption.

And Irvinil 620 gives you these other sought-after processing and product advantages, as well: strength, versatility of application, rapid dry blending properties, exceptional heat and light stability, high bulk density, very good color retention and fine electrical properties. A final point: even with all these advantages, Irvinil 620 costs you no more!

Irvinil 610 PVC

Irvinil 610, a general purpose high molecular weight polymer, is a harder resin than Irvinil 620, specially designed for dry blend extrusion and injection molding. It possesses identically the excellent properties of the medium molecular weight resin.

As a pioneer in plastics, Great American is unusually well qualified to help you solve your fabricating problems—particularly your needs for special resins and compounds. Write us today for data and laboratory samples of the Irvinil Resins—and technical help on your special requirements. GREAT AMERICAN PLASTICS COMPANY, 650 Water Street, Fitchburg, Massachusetts. Factories in Fitchburg and Leominster, Mass.; and Nashua, N. H.

IRVINIL Resins

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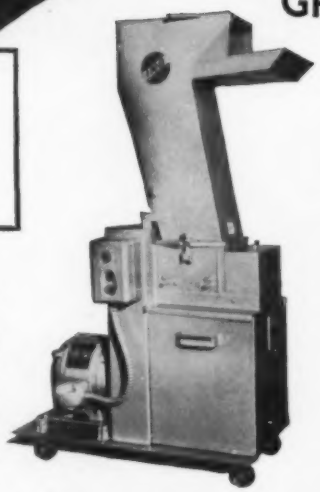
INJECTION MOLDERS!

BOOST PRODUCTION!

M-3 IMS M-4 GRANULATORS

All machines illustrated here in stock for

IMMEDIATE DELIVERY



The IMS M-3 6½" x 7" throat sprue grinder — rugged — simple in design — easiest to clean — built-in throat clearance bar — casters — catch pan.

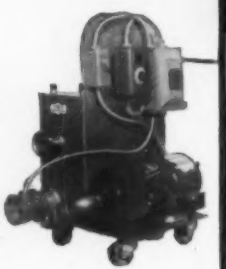
PRICE: Complete with 1 HP Motor and Starter ---$598.50
Same, but with 2 HP Motor --------$645.00



The IMS M-4 5⅜" x 8½" throat grinder — designed primarily for vinyl, polyethylene, plastisols and all elastomerics where a fine-free low bulk factor product is desired — large throat for large injection molded parts.

PRICE: Complete with 2 HP Motor and Starter $788.50
Same, but with 3 HP Motor $854.00

CONSTANT MOLD TEMPERATURE REGULATOR



The IMS Economy Circulator — **priced at only $369.50 complete (oil model for heats to 450° at $482.50)** — duplicates performance of mold heaters costing up to 6 times as much — developed by a molder for molders — compact — portable only 15½" x 22" floor space.

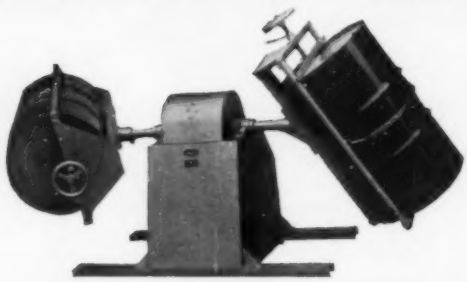
NOTE: Special price for 2 units ---- $349.50 Each

Send for our New Nozzle Catalog and Heater Band Book Today. You'll find all styles of nozzles and heater bands fully described and priced, with technical notes on nylon molding.

Prompt service on all kinds of nozzles by the world's largest and most experienced nozzle and heating cylinder specialists.

IMS DRUM TUMBLERS

FOR ALL COLORING AND MIXING OPERATIONS



All IMS Drum Tumblers are based on design suggestions of the leading material and colorant suppliers.

Available for immediate shipment from stock.

¾ HP Model ---------- $595.00
(Takes drums up to 33" high x 22" in diam.)

2 HP Model ---------- $897.50
(Takes drums up to 37" high x 23¼" in diam.)

3 HP Model ---------- $1285.00
(Takes drums up to 45" high x 24" in diam.)

INJECTION MOLDERS SUPPLY CO.

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CLEVELAND 20, OHIO



polyvinylchloride

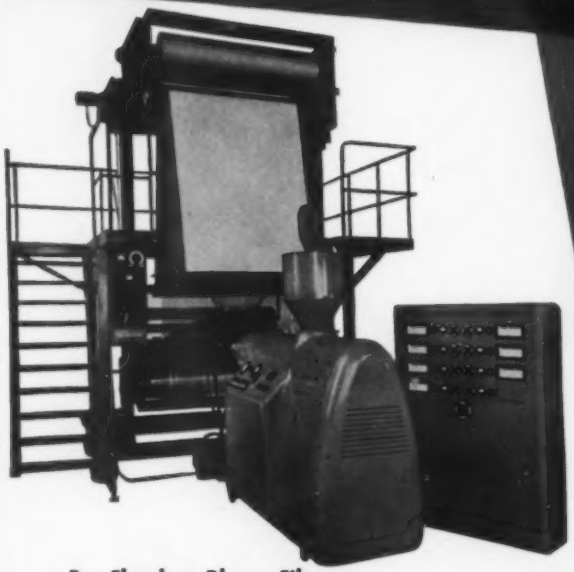
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Special copolymers designed for solution applications.

Solvic is supplying PVC and copolymers in large quantities to plastic users throughout the world. In addition, Solvic manufactures PVC compounds and colour concentrates (masterbatches) under the trade name, BENVIC.

Write for additional technical information.

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For Flawless Blown Film

complete installations for lay-flat tubing up to 55" double width

For extra heavy Requirements



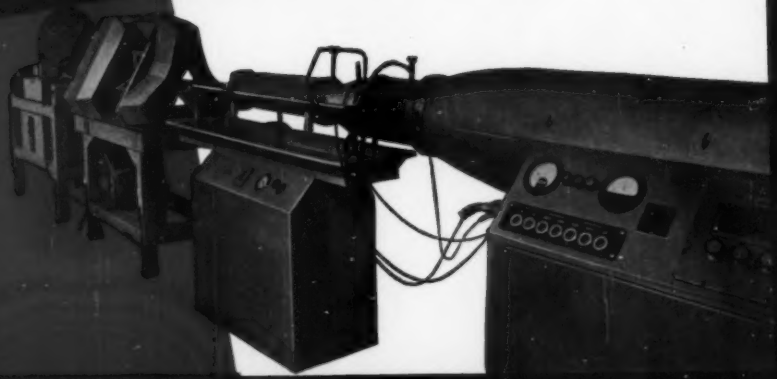


For Uniform Flat Film

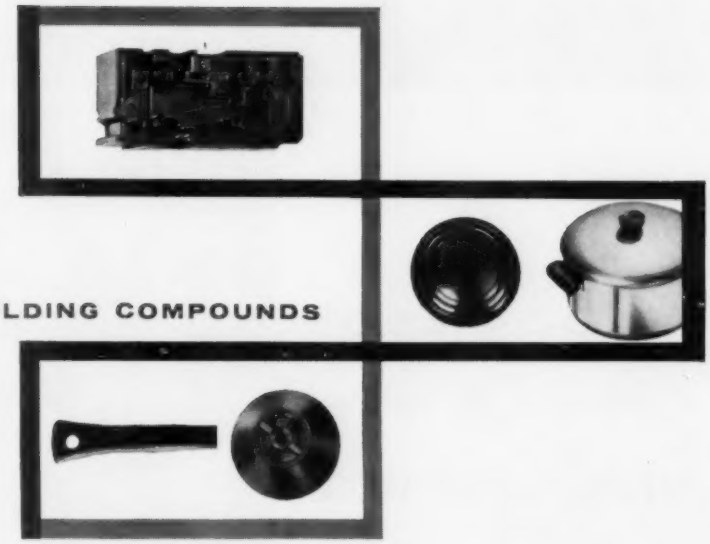
complete installations for flat film up to 60" width, incl. combined take-off-trimming- and wind-up equipment



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A GOOD WORD FOR

QUALITY PHENOLIC MOLDING COMPOUNDS

IN THEIR

WIDEST APPLICATION

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. . . a good word, too, for dependable counsel. Whether you take our advice or not, you can't help but profit from your consultation with Plenco's problem-solving specialists. And, in production, you can't help but benefit from the wide-ranging knowledge with which these modern molding materials are formulated and the precision with which they are produced.

Does phenolics have the answer for you? Then, chances are that Plenco compounds, in their exceptional variety, versatility and quality-controlled uniformity, can provide it. We invite you to let us demonstrate that.

PLENCO PHENOLICS
FOR BETTER PLASTIC PRODUCTS

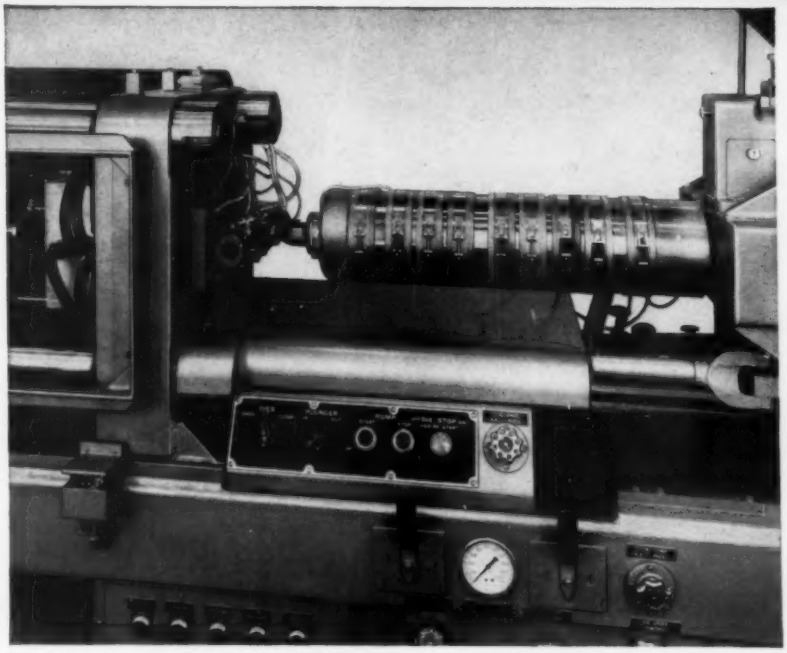
PLASTICS ENGINEERING COMPANY

Sheboygan, Wisconsin

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

NEW REED FEATURES...

4/6 OZ. REEDS OFFER 4 NEW ENGINEERING ADVANCES



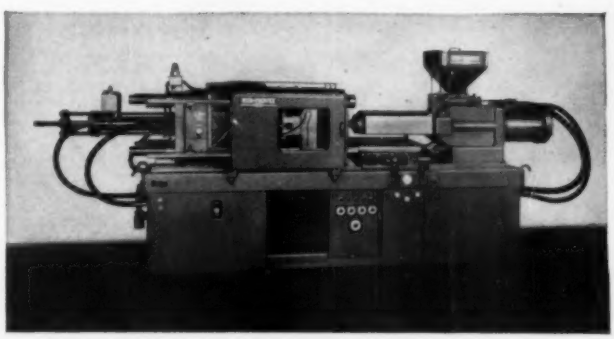
Here are the big new features that set today's 175T—4/6 oz. REED way out in front for high-speed, automatic operation:

New twin nozzle arrangement means faster, sprueless automatic molding. A Reed-Prentice exclusive, this multiple nozzle (shown above) makes it possible to use the 175T with a standard single nozzle when desired, increases the machine's versatility. Changing to this optional accessory can be done in minutes.

New Jumbo heating cylinder shown above has twice the capacity of a standard 175T heating cylinder. Available as optional equipment, the new Jumbo assures speedier plasticizing and more material for fast, automatic molding and heavy shots.

New high-torque, 15 H. P. motor is now standard equipment on the 4/6 oz. REED. It cuts dry cycle time to 5.7 seconds. In sustained production, a 175T with twin nozzles is now molding 2 one-pint containers on a 6-second cycle—1,200 pieces an hour.

New long-stroke 175 TL—4/6 oz. model (below) now provides infinite mold stroke adjustments between 6" and 12". It is ideal for deep draw containers.



Get complete information on these new REED features by calling your Reed-Prentice Sales Engineer today.

Engineered for Modern Molding



"YOU CAN'T BEAT NEW REEDS FOR AUTOMATIC OPERATION"

SAYS ERIK E. ERIKSON,
President of Detroit Plastic Products Company

"As far as I'm concerned," says Mr. Erikson, "the ideal production set-up would be new REEDS, running automatically. Of our 9 machines, 4 are less than two years old, and I plan to replace the others as rapidly as possible. I'm thoroughly sold on the benefits of these latest REED models—they're rugged, fast and well-designed. Using them on automatic operation, we've proved that we get high volume and quality at minimum cost, can improve production per machine as much as 25%."



Mr. Erikson has 8 of Detroit Plastics' 9 REEDS on one production line in this modern plant. In telling why he found the new REEDS so superior, he cited two examples: (1) a 175T—4/6 oz. machine that has run over 20,000,000 small nylon rollers with no trouble whatsoever; and (2) a 400T that outproduced the old 16 oz. REED it replaced as well as competitive 16 and 20 oz. machines by as much as 30% on a 52-cavity mold for small model cars.

It costs you nothing to find how much you can gain by investing in new REED equipment. Your Reed-Prentice Sales Engineer will be glad to arrange a free mold demonstration test, or to make a production survey which will show how new machines can boost your present output. Call him today, or write to our main office in Worcester.

REED-PRENTICE

Division of PACKAGE MACHINERY COMPANY

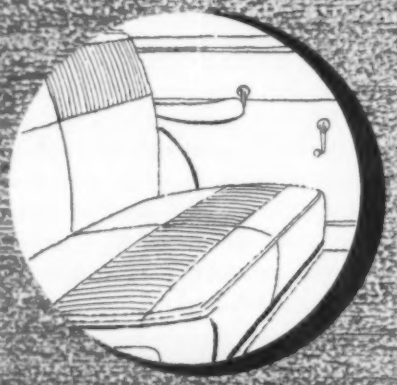
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FDA acceptance for direct contact with food—approved by National Sanitation Foundation for piping of potable water—outstanding resistance to abrasion, grease, staining and low temperatures.





From years of Hercules research in the development of organometallic catalysis systems have come the two new polyolefins that are the talk of the plastics industry—Hi-fax high-density polyethylene and Profax polypropylene.

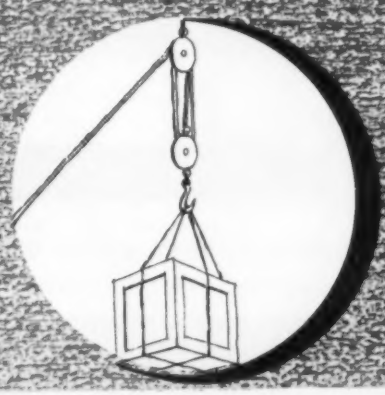
The broad combination of properties of these two materials makes available a perfect team that is almost certain to meet your requirements. Already well established, Hi-fax is now being used in such applications as toys, packaging, fabrics, wire coatings, pipe, and

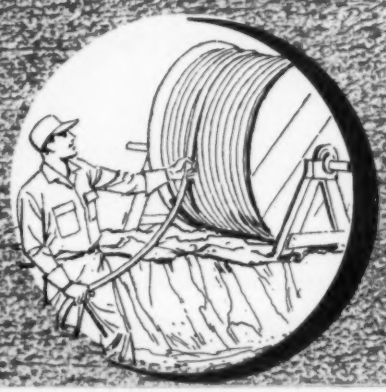


HERCULES

CP58-2







NEW PLASTICS ERA
a Choice of Polyolefins

Lightest of all plastics—hard and lustrous surface finish—resists deformation at 300°F.—rigidity—high impact strength—easy to mold—broad range of rich colors.

pro-fax
HERCULES TRADEMARK

wherever the unusual characteristics of high-density polyethylene result in a superior end product.

Now Hi-fax is complemented by Pro-fax, America's first polypropylene. This amazing new material will greatly broaden the markets for plastics, especially those now served by wood, metal, and glass.

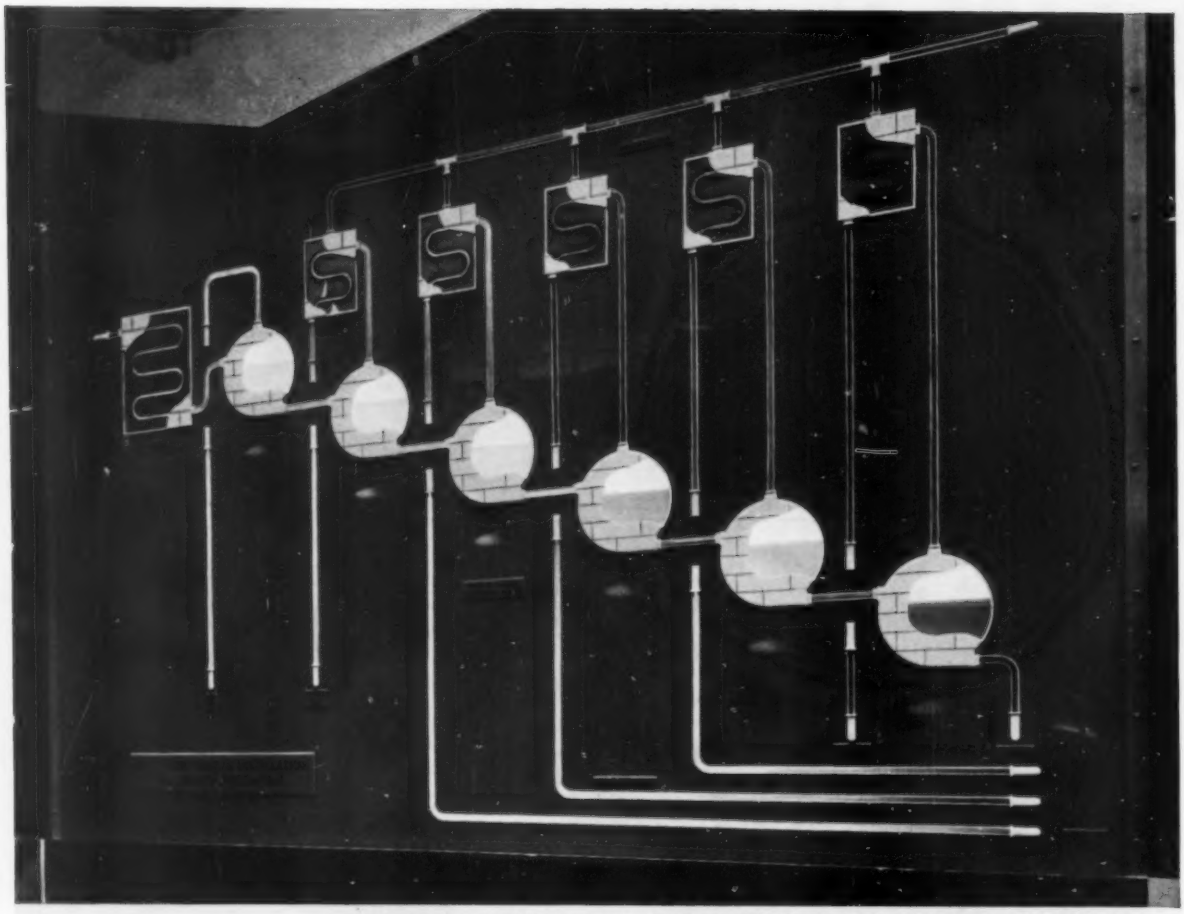
Why not learn more about these two pace-setting plastics? For detailed information on properties and uses, call or write Hercules.

Cellulose Products Department
HERCULES POWDER COMPANY
INCORPORATED
900 Market Street, Wilmington 99, Delaware









This is a 6' x 4' animated display panel made of 'Perspex' by Pennant Display & Engineering Ltd., Cheltenham, for Shell Mex & B.P. Limited. It is one of four used to demonstrate the complicated process of oil-refining.

'Perspex' shows how an oil-refinery works

HOW BEST can one explain a difficult problem or a complicated process? Often, as Shell Mex & B.P. found, the best way is by an animated display. And an excellent material for an animated display, is 'Perspex' acrylic sheet.

'Perspex' is extremely easy to shape and handle—even large or intricate displays can be made. It is very tough, light and long lasting. Because of its clarity 'Perspex' is particularly suitable for displays where transparency is required.

'Perspex' is available in a wide range of transparent, translucent or opaque colours. 'Perspex' will withstand weather conditions in any part of the world. Modern designers use this durable, attractive material for many applications both indoors and out.

·PERSPEX·

'Perspex' is the registered trade mark for the acrylic sheet manufactured by I.C.I.

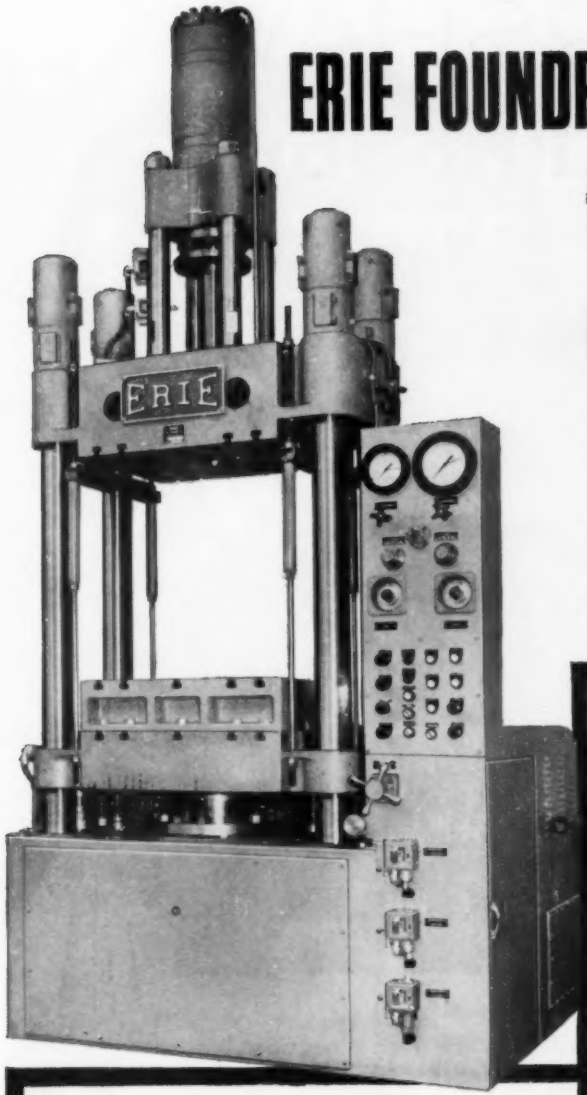
IMPERIAL CHEMICAL INDUSTRIES LIMITED, PLASTICS DIVISION: EXPORT DEPT., BLACK FAN ROAD, WELWYN GARDEN CITY, HERTS.

U.S.A. enquiries to: J. B. Henriques Inc., 521 Fifth Avenue, New York 17, N.Y.

Canadian enquiries to: Canadian Industries Ltd., Plastics Dept., Box 10, Montreal, P.Q.

OP.27

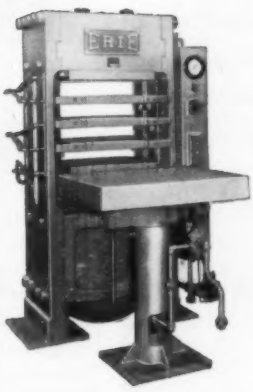
ERIE FOUNDRY HYDRAULIC PRESSES for MOLDING RUBBER and PLASTICS



Hydraulic presses, designed and built by Erie Foundry Company are precision presses in every sense of the word . . . tonnages are accurate and precisely applied, platen temperatures are closely controlled, and molding cycles perform at split second timing. Erie Foundry Hydraulic Presses are flexible too . . . readily adaptable to almost any molding job. Write for complete information on these presses or on the complete line of Erie Foundry rubber and plastic hydraulic presses.

TRANSFER and COMPRESSION MOLDING PRESS

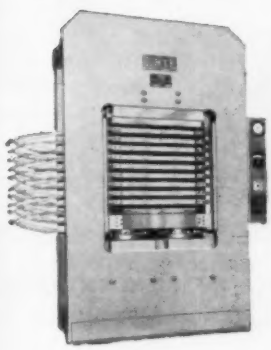
A flexible press for both compression and transfer molding is this 200 ton self-contained semi-automatic Erie press. This machine is equipped with a 55 ton transfer cylinder which can be timed separately from the main ram, as well as knock out cylinders on the bolster and a mechanical knock out for the top mold. Automatic cycling can be easily arranged to mold almost any product.



STRAIN PLATE PRESS for MINIMUM DEFLECTION

The platens stay parallel within .002" on this 314 ton press built of low-stress construction throughout. This press can be converted to transfer molding if desired.

We built the hydraulic lift table, too.



HOT PLATEN PRESS OF ECONOMICAL DESIGN

This 800 ton press is compact and rigid. Accurate platen alignment is maintained with minimum deflection over entire range of platen temperatures.

Hydraulic Press Division

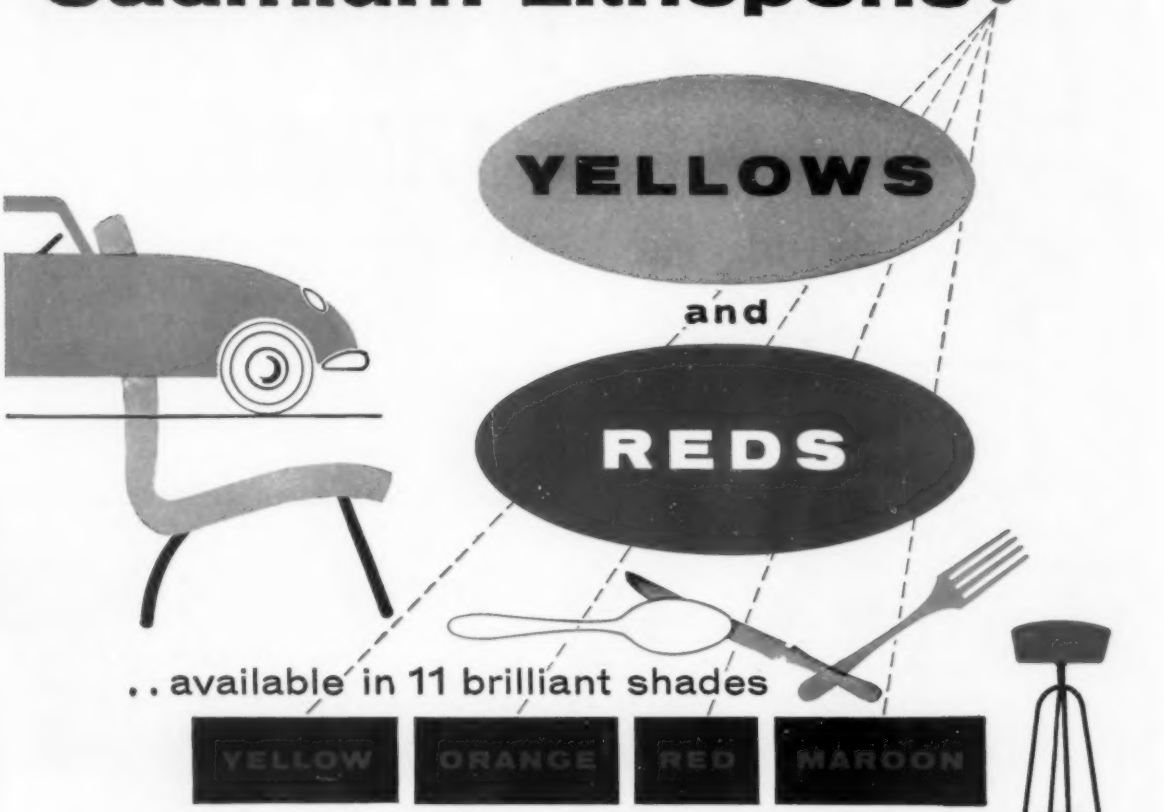
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HARSHAW

Cadmium Lithopone





Send for color folder showing complete line of Cadmium Lithopone Yellows and Reds.

For colorful products in rich deep tones or delicate pastel tints, use Harshaw cadmium pigments.

The chemical and heat resistance of cadmium yellows and reds combined with their complete insolubility make them excellent for use in plastics, printing inks and industrial finishes.

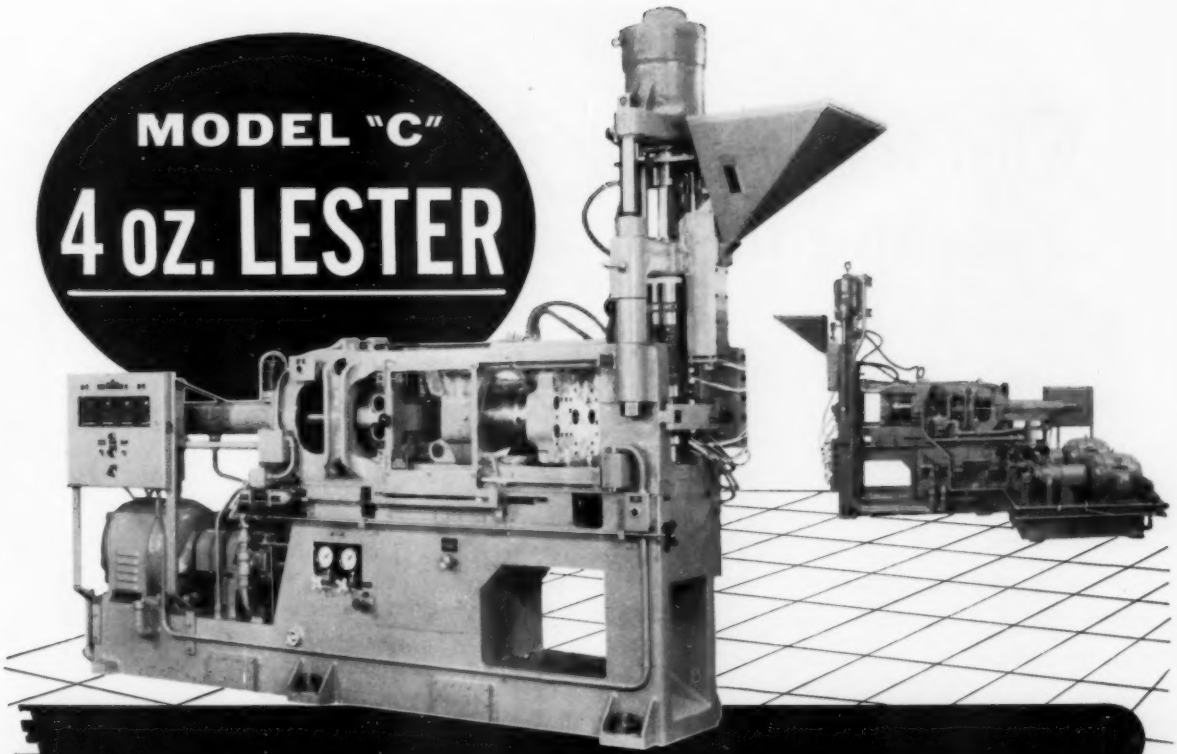
CORRESPONDING SHADES OF CONCENTRATED C. P. CADMIUM PIGMENTS ARE ALSO AVAILABLE

THE HARSHAW CHEMICAL COMPANY

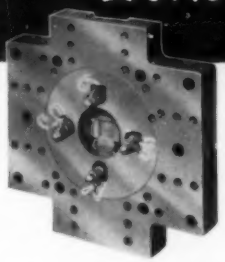
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MODEL "C"
4 oz. LESTER



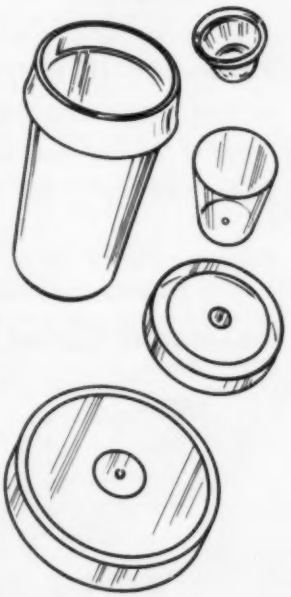
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Unique nozzle manifold provides multiple nozzle setup for feeding cavities directly. Short nozzle lengths (independent of injection cylinder) minimize thermal expansion stress in gate area of cavity. Runner bars are interchangeable for 2 or 4 nozzles on 6" or 7-1/2" centers. Manifold can be set up or removed like a mold, with no weakening of stationary die plate. A valuable adjunct to container molding.

For productivity, speed, and lack of maintenance in molding containers, the Model "C" 4 oz. Lester beats them all. Consider the record: in one case it has been molding a .014" wall shot glass at the rate of 1,024 shots per hour in a 4 cavity mold—*that's a 3-1/2 second cycle!* Other Model "C" machines have run continuously for a year at cycles between 5 and 8 seconds, with no more than routine maintenance. With the standard cylinder the Model "C" is producing 80 pounds per hour of containers.

Now consider the features: double pumping systems; front opening in machine base for automation; 150 tons of clamp (strain gage rated); low pressure closing circuit; ample mold space; hardened pins and bushings; and hardened gibs to prevent platen sag. FOR COMPLETE DETAILS, WRITE TODAY.



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To open up these new profit opportunities for manufacturers of paper products, textiles, non-woven fabrics, floor coverings and cast and laminated plastic products, The Dobeckmun Company has created Metalflake.

Developed by the originators of Lurex non-tarnishing metallic yarns, Metalflake is the trade name for precision-cut decorative aluminum flakes in over *30 high-fashion metallic colors*, and in a variety of shapes including squares, rectangles, stars, crescents and circles.

Because Metalflake is made from aluminum foil laminated with either Mylar* polyester film or acetate, or from lacquer-coated aluminum foil, there is a type of Metalflake available for many applications—and at low cost.

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NEW IDEAS

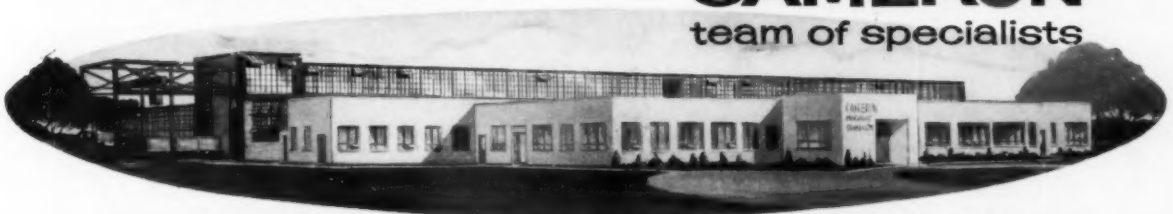
in slitting and roll winding...

NEW IDEAS are the driving force of the paper, film and foil industries. Changes come swiftly, compelling constant advances in slitter-winder design. Cameron specialists are working today on slitters and roll winders for handling such typical new materials as polystyrene, polyvinylidene chloride, polyester film, linear polyethylene, aluminum and copper foils, release papers, fibre glass, and many others. Cameron's team of slitter-winder specialists is *expected* to have the best answer to any question in roll production. You'll find it pays to bring your slitting and roll winding problems to the attention of Cameron specialists.

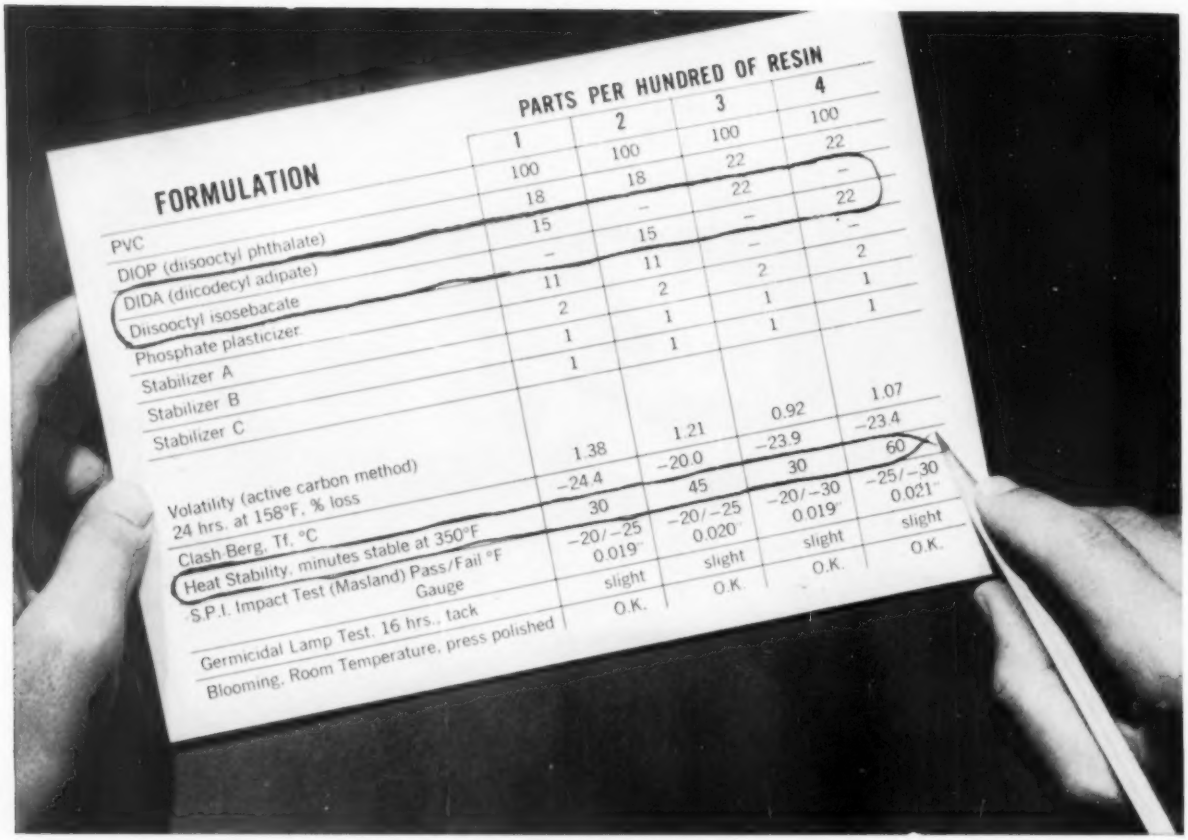
NOW, blending with 50 years of Cameron experience, are the complete modern facilities of the new Cameron plant, dedicated in November 1957. In this new home are costly new precision machine tools, extensive modern equipment for testing and experimental work, and the expanded Cameron production facilities . . . teamed together to serve you better.

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This test shows

HEAT STABILITY OF PLASTICIZED VINYLS IS IMPROVED BY ESTERS OF ISOSEBACIC® ACID

ISOSEBACIC® acid, a new synthetic 10-carbon dibasic acid, has many plus values that recommend it as an intermediate for vinyl plasticizers. You'll see one example in the above figures—results of a test made recently by a processor of vinyl plastic film.

Read down columns 1 and 2. *Heat stability improves 50%* (from 30 minutes to 45 minutes) when 15 parts of an ISOSEBACIC acid ester replace 15 parts of an adipic ester in this formulation.

Read down columns 3 and 4 and you see an even more striking result in a test where higher ester levels were used. ISOSEBACIC acid ester actually *improves heat stability 100%* (from 30 minutes to 60 minutes).

Among the plus properties of ISOSEBACIC acid esters as vinyl plasticizers are:

- Low color
- Low odor
- Low oil extraction
- Low soapy water extraction

And ISOSEBACIC acid has other uses in the plastics field. It can be used as an intermediate for polyamides, polyesters, polyurethanes and alkyd resins. If you make any one of them—or a vinyl plasticizer—it will pay you to evaluate U.S.I. ISOSEBACIC acid. Send today for data sheets and samples.

CHEMICAL PROPERTIES

ISOSEBACIC acid is a mixture of C-10 dibasic acids—2-ethyl suberic; 2,5-diethyl adipic; and sebacic. It undergoes typical reactions of dibasic acids. It yields acid and neutral esters, acid and neutral salts. Relatively stable, it is not oxidized by air at ordinary temperatures.

PHYSICAL PROPERTIES

Molecular weight	202.24
Combining weight	101.12
Density (80°C)	1.025 g/ml
	8.55 #/gal
Melt viscosity (80°C)	78.5 centipoises
Specific heat of vapor (226°C)	0.34 cal/g (est.)
Heat of vaporization (226°C)	107 cal/g
Specific heat of solid (24°C)	0.33 cal/g
Heat of Combustion	1296 K cal/mole
Flash point (closed cup)	430°F.
Ionization constant at 25°C	$K_1 = 3.5 \times 10^{-5}$
	$K_2 = 5.1 \times 10^{-6}$

U.S.I. INDUSTRIAL CHEMICALS CO.
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SEMI AUTOMATIC
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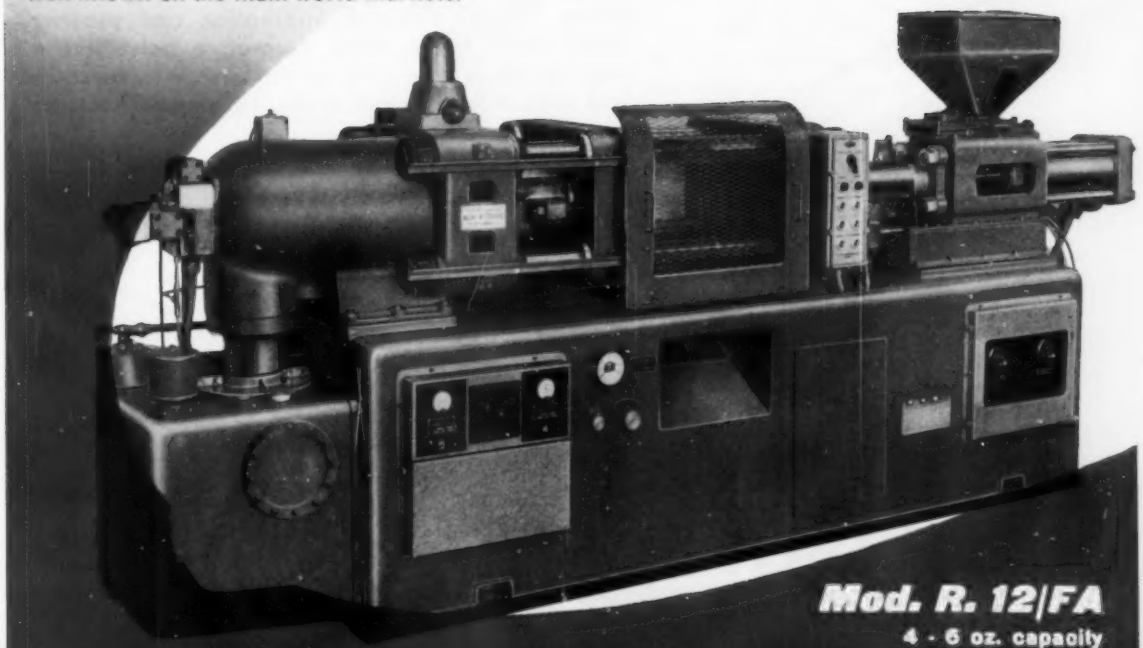
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FAST CYCLE
FULLY AUTOMATIC
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The Plastiscope*

March 1958

News and interpretations of the news

By R. L. Van Boskirk

Section 1

Polyethylene price maneuvering. In mid-January Eastman Chemical Products announced a price of 32½¢ for several polyethylene molding compounds of the types generally used in housewares moldings. In general, they are classified as high-melt-index resins. The former price was 35 cents.

The trade generally took the move to mean an attempt to stabilize the price of polyethylene in the particular area of housewares, toys, and similar moldings where high-flow formulations are commonly used. There is said to be a range of prices in that area, largely induced by the great amount of sub-grade polyethylene now available. When sold by a producer direct to the molder, it is always a few cents less than the list price for standard grade. But it is also sold in great quantities to distributors for less than 30¢ and then resold to the molder. There are critics who insist that standard grade polyethylene, which was supposed to sell at 35¢/lb., sometimes got mixed up in this price complex and reached molders at less than standard price. Hence the price reduction.

But the Eastman torpedo went off quietly without starting a general conflagration. The only resins so far affected have been the high-melt-index, low-density molding variety. Bakelite, for example, has no resin of that type; consequently, its standard molding grade resins as well as film grade remain at 35 cents. Du Pont met the situation by introducing a new resin, Alathon 18, "for molded dish pans, wastebaskets, and other large pieces" to sell at 32½¢ cents. It has a density in the range of 0.915 to 0.916 and a melt index of 25. It is a companion material to Alathon 17, which has a density of 0.923 and sells for 35¢, and Alathon 37 with a density of 0.930 that sells for 39 cents. Note that cost goes up as density increases.

Other companies report in a similar vein. U.S.I., for example, states that a new low-density resin will be produced to sell at 32½¢ and present molding compounds will remain at 35 cents. Spencer Chemical has reduced the price to 32½¢/lb. on three molding grades that vary in density from 0.914 to 0.917 and have melt indexes of 8, 22, and 50, respectively.

All the evidence indicates that prices in the future will depend upon the kind of polyethylene a customer wants—film, bottle, pipe, and electrical grade all will have individual price tags.

Movie film on polypropylene. The first sound movie to be produced on the subject of polypropylene was shown at Hercules Powder Co.'s conference last month where the company's annual statement was discussed with the press. The movie shows operational processes and finished polypropylene (Pro-fax) products. The plant at Parlin, N. J., can now operate at a rate of 20 million lb./

*Reg. U.S. Pat. Off.

THIRD OF A SERIES

Chemical Division GENERAL THE GENERAL TIRE & RUBBER CO. VYGEN

THE GENERAL TIRE & RUBBER COMPANY
CHEMICAL DIVISION • AKRON, OHIO



INTER-OFFICE MEMORANDUM

FROM: Chief Chemist

TO: Production Superintendent

SUBJECT: VYGEN PVC RESIN

PVC Resins from General Tire's Chemical Division recently were brought to our attention, and have been evaluated by the product chemists. Test results are most promising, and indicate the advisability of factory trials whenever possible.

VYGEN 105 will fit very nicely into our injection molding program. It has excellent flow characteristics, very good heat stability, and provides a glossy surface. We recommend it also for extrusions requiring a very high gloss.

VYGEN 110 is a general purpose resin with extremely good heat stability. This resin, when used in calendering the pastel shades, will overcome the rejects you have had due to color drift. It is ideal for calendered film, sheeting and coated fabrics.

The third resin in this group, VYGEN 120, is extremely interesting. It can be dry-blended with polymeric plasticizers and extruded from the dry blend. This one can save us money by eliminating the pelletizing operation. It has the best heat stability of any resin we have ever tested, and should be used in the clear extrusions where you are presently having trouble with stability. Incidentally, Vygen 120 has excellent electrical properties. We are working on it now for the new job coming up in this area, and will keep you posted on further developments.

VYGEN 161 should be tried for making a pigment-plasticizer-resin masterbatch. This is a color-addition method far superior to the color paste and dry color techniques we have been using. The color masterbatch is much easier to handle and weigh, allowing more efficient operation and improved color control.

After you have gone over the attached test results, we would like to discuss with you areas and applications where these specialized resins can fit into our production picture.

A L Bourgeault

Chief Chemist

The Plastiscope

(*Continued from page 37*)

year and already plans are being studied for an expansion. The price of Profax at 65¢ now makes it competitive with many of the 40 to 70¢ plastics for certain applications because its specific gravity is 0.9 to 0.910—lowest of all commercial plastics. Thus, a material with a specific gravity of 1.2 and selling at 50¢/lb. would cost 60¢ on a volume basis compared with 59.1¢ for polypropylene. This factor, plus certain inherent properties, plus the possibility of thin-wall construction, make polypropylene a contender for markets with most plastics that sell in the 40¢ and up range.

Hercules drops methacrylate. Among other significant factors pointed out in the company's annual statement were that Hercules has dropped its plan to build a methacrylate plant in cooperation with I.C.I. because it is "currently unattractive;" confirmation of the company's plan to discontinue manufacture of acetate in 1959, following discontinuance of acetate flake after 1958; and that new plants of direct or indirect interest to plastics completed in 1957 were those for high-density polyethylene, pentaerythritol, formaldehyde, methanol, paracresol, and terephthalate, plus expanded nitrocellulose facilities. Gross sales in 1957 were $255 million compared with $244 million in 1956. Plastics accounted for 6% of total sales with protective coatings—the largest category —at 16 percent .

New sheets for thermoforming. Gilman Bros., Gilman, Conn., is marketing two new sheet materials for thermoforming. One, called Gilco, is reported to be the first thermoformable sheet made from Alathon 31. It is available in thicknesses from 10 to 250 mils, in any color, and in 52-in. width. The second material is Gilco 50, of unrevealed content. The temperature resistance is from —40 to 175° F. It is furnished in thicknesses from 10 mil to ¼ in., in any color and grain, and in 52-in. width. It is suggested for the manufacture of luggage.

Phillips brings out improvements. Twice in the past month Phillips Chemical has brought out improved varieties of its Marlex 50 low-pressure-processed polyethylene. The most recent is Type 2 Marlex 50, a resin designed particularly for sheet and bottles. It has a low melt index of 0.2 with a high melt viscosity or strength. Melt index of the other four Marlex types varies from 0.9 to 5.0. When compared with the other four, the most significant properties of Type 2 are increased toughness, greater environmental stress-cracking resistance, higher melt viscosity, and a slight improvement in creep properties. Density of Type 2 is 0.96 and softening temperature is 260° F.

The properties of Type 2 are desirable in extrusion and calendering of sheet for vacuum forming. High melt strength minimizes sag during forming and makes possible fabrication of large parts. Also, finished parts have more uniform wall sections than those made with higher-melt-index Marlex types.

Clear film from low-pressure polyethylene. The other Phillips headliner was a method for producing clear film out of Marlex 50. Samples shown were less

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Precision Plastic Molders

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The Plastiscope

(*Continued from page 39*)

than 1 mil thick. It is being aimed at the overwrap market where its "stiffness" is declared more satisfactory than the limpness of conventional polyethylene.

The process will be released to commercial extruders, says Phillips. The secrets in obtaining clarity are apparently quick quenching in a water bath; a finer screen pack; slightly higher stock temperature; and positioning of the die lips within ¼ in. of the water bath surface. Marlex 50 film has been extruded from a T-die by this water bath technique in a range of from 0.4 to 0.6 mils thick at 175 ft./min.

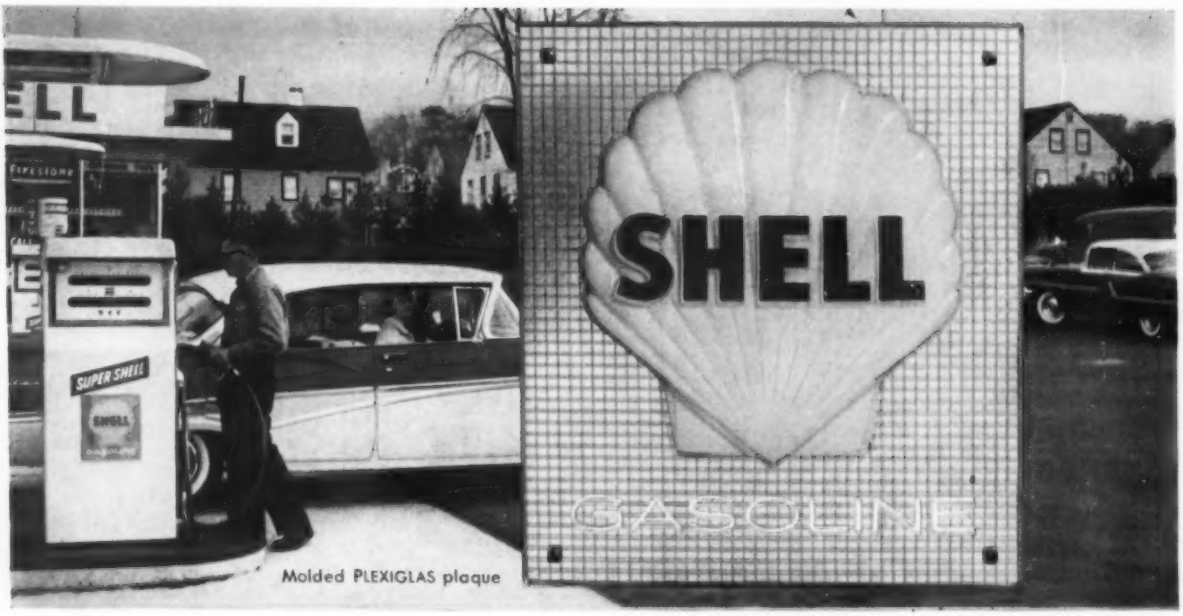
The orientation of the resultant film should be satisfactory for "easily openable" packages. Half-mil film has a tensile strength in the machine direction of 12,210 p.s.i. and 4632 p.s.i. in the transverse direction; elongation percentage in the machine direction of 118 and 8 in the transverse direction.

Vinyl chloride capacity. In listing companies which started producing vinyl chloride resin during the past year in the January 1958 issue of MODERN PLASTICS, the capacity for Great American Plastics Co., Fitchburg, Mass., was given as 3 million pounds. Officials of the company spotted the error and notified MODERN PLASTICS that the capacity figure should be 13 million lb. per annum.

Grace dedicates new low-pressure polyethylene plant. The Grace polyethylene plant with a capacity of 50 million lb. per year is now officially on stream. An outstanding feature at the dedication ceremonies was the introduction of the company's own process for producing clear, oriented film from low-pressure polyethylene. It differs from the method described above in that the film, extruded from a flat die, is cast onto a chilled roll. Grace claims that this gives the film higher impact strength than when it is produced in the conventional manner. The new, clear films are expected to be used for overwraps without too much alteration of present equipment. Technicians believe puckering can be overcome by holding the film under tension, and that even though it stretches a bit more than cellophane, this fault can be overcome by temperature and other control methods. Tear strength is claimed to be greater than cellophane.

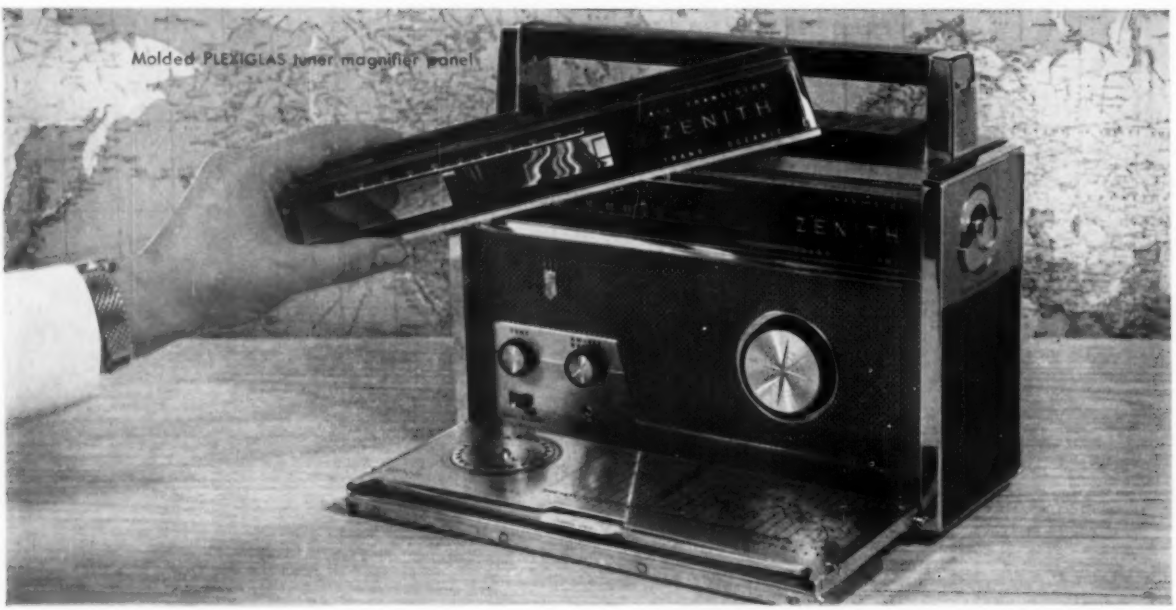
Grace has also announced acquisition of an exclusive license from Columbus Coated Products, Inc., for rights to a new injection molding technique that reputedly saves up to 25% manufacturing costs. Instead of the usual gate, each cavity has a quick-opening valve that is kept closed until the injection ram has built up high melt pressure. The valve is then opened and the melt gushes into the cavity, giving accurate, strain-free pieces. Grace is responsible for arranging licenses, involving royalty payments to Columbus.

Other highlights at Grace dedication. Grace spokesmen pointed out that the company grew from almost nothing to ninth position among U. S. chemical companies during the period from 1952 to 1955. Its Dewey and Almy Div. now has new Cyrovac plants in Greenville, S. C., Canada, Australia, and Germany and a new sealing compound plant in Australia. Its Davison Chemical Div. is now operating a big catalyst plant in Maryland. There is a new Grace research



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The Plastiscope

(*Continued from page* 41)

plant near Washington, D. C., and a semi-works plant in Louisiana concentrating on polyolefins. Its Polymer Chemicals Div., in New Jersey, specializes on modified polyolefins.

Interesting new items made from high-density polyethylene shown at the dedication were a bilge pump that will float, fabric for furniture, a package for potato chips with exceptional moisture barrier properties, valve assemblies and faucets, a nose guard for football players, and others.

Foster Grant broadens nylon activities. A licensing agreement with Farbenfabriken Bayer, of Germany, to sell and manufacture that company's complete line of both regular and special types of nylon-6 materials has been completed by Foster Grant Co., Inc. The latter will import and sell the Bayer products until such time as equipment can be installed to produce them. One of the new Bayer nylon types is claimed to be crystal clear in relatively thick sections. Another has high crystalline characteristics but can be molded over broad temperature and pressure ranges.

Another Bayer nylon is claimed to have outstanding weather-resistant characteristics and to be suited for wire and cable coatings. Other types are hot-water resistant for use in pump impellers and handles of surgical instruments; an ultra-high viscosity variety; one containing graphite; and another containing disulphide for anti-friction bearings.

All the special Bayer nylons will be handled by Foster Grant as additions to its regular grades.

Drug firm steps up interest in polystyrene. The recent announcement that Seamless Rubber Co., Holyoke, Mass., would buy styrene monomer on a large scale from El Paso Natural Gas Products Co.'s new plant near Odessa, Texas, is convincing evidence that another powerful American company aims to make an impression in the plastics industry.

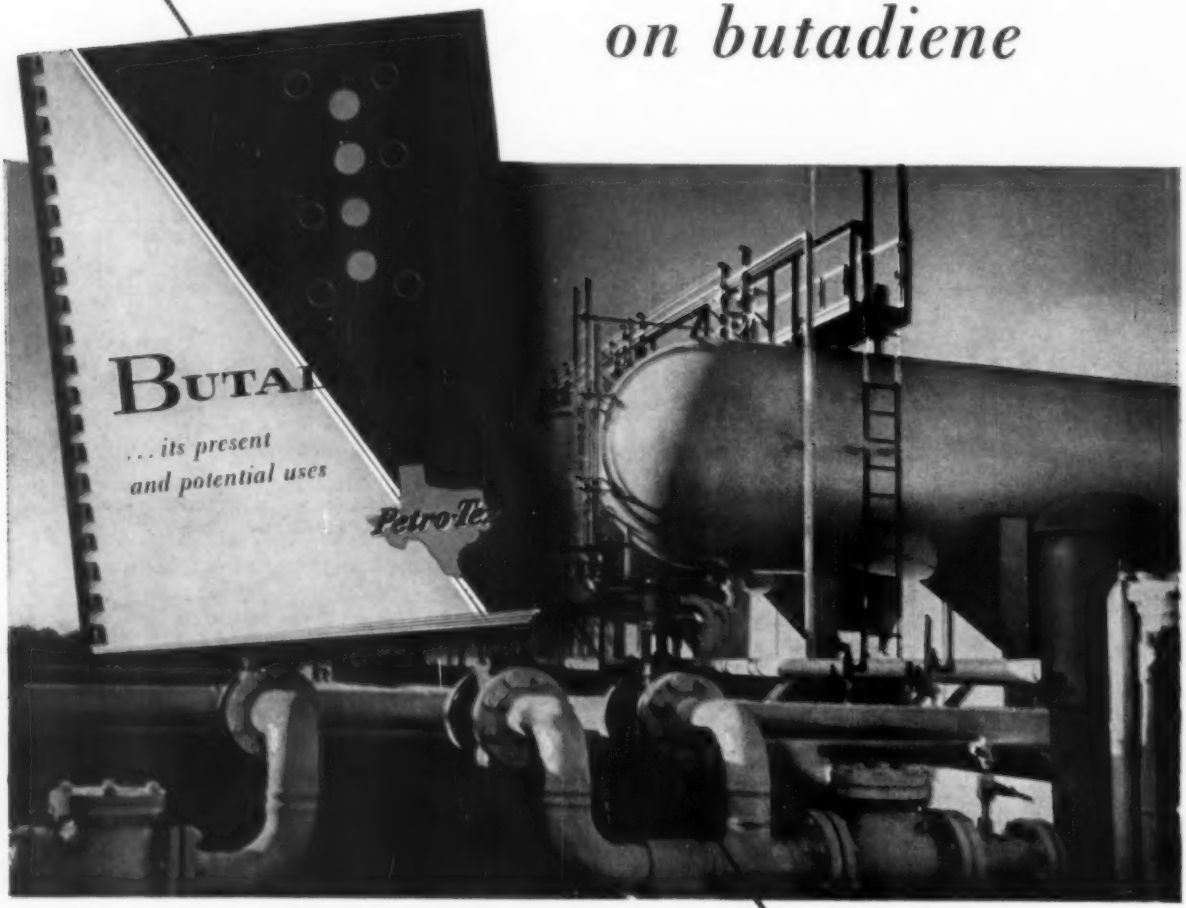
Seamless Rubber Co. has been a subsidiary of Rexall Drug Co. since 1916. Shortly after the purchase of Seamless, Seamco Chemical Co. was established as a division of Seamless to produce polystyrene. Up to now, production has been relatively small and confined to a narrow area, but it has been reported that Seamco will eventually take 15 million lb. of Gas Products' monomer production, which has been announced as 40 million lb. per year. Seamco does not mold polystyrene but will sell the entire output to molders.

The Rexall move, which is in the interest of diversification, may be the first of several to be made by manufacturers interested in getting into plastics by the polystyrene route. The reason why is not obvious since supply is well ahead of demand, sales have leveled off in the past two years, and the effect of competition from the new olefins has not yet been ascertained.

Seamco and Gas Products Co. are apparently aware of this situation and the need for promotional and development work since they have announced a joint research laboratory to be constructed in Holyoke, Mass., for the purpose of "developing new and improved plastics," suggesting that the company will eventually be in other plastics besides polystyrene.

For additional and more detailed news see Section 2, starting on p. 224.

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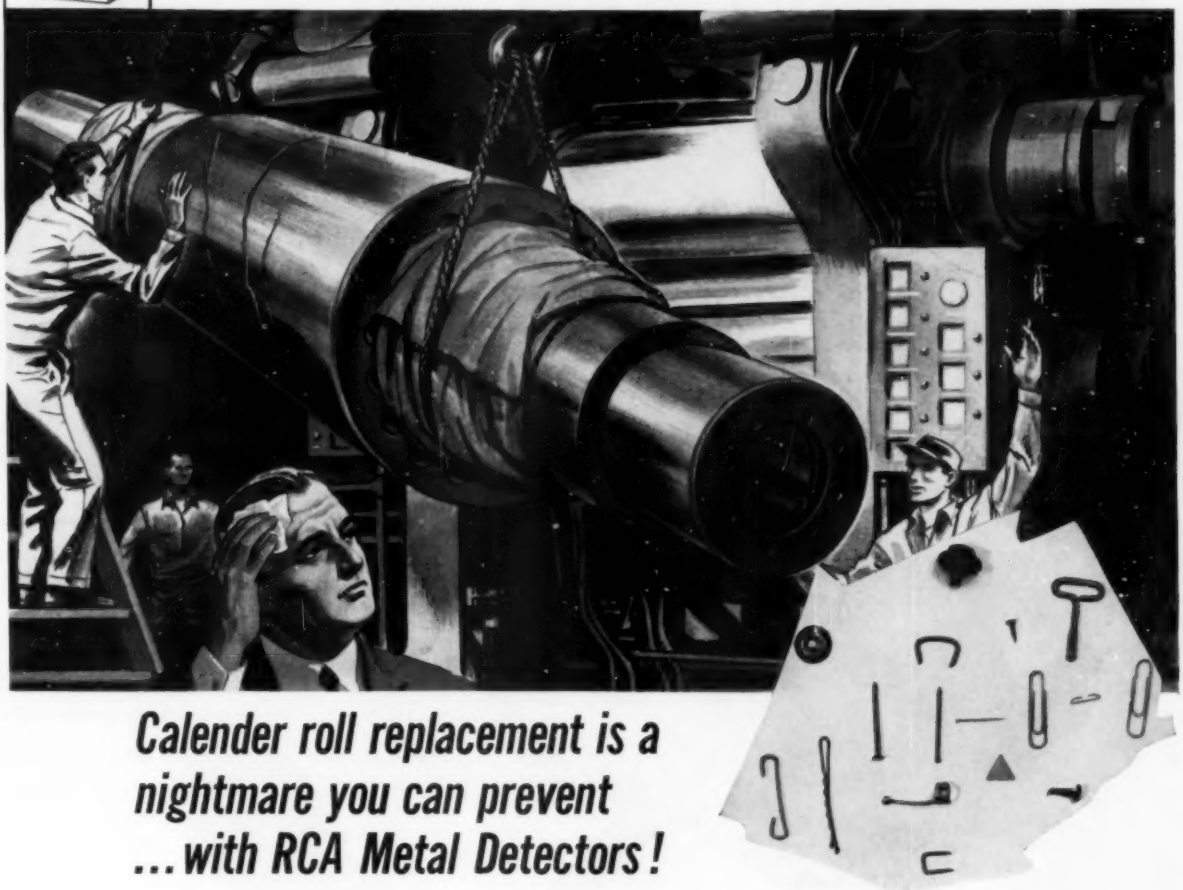
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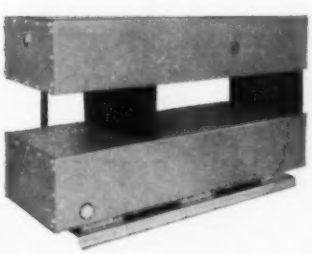
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Mold.....2 cavity

Cycle time.....57 seconds
Weight of shot.....22.5 ounces
Material.....Acetate
Mold.....12 cavity

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IN MOLDING

The STYRENE for





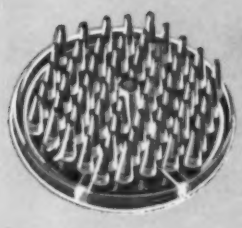


Insulated beverage server molded from C-11 (for resistance to heat and food stains) by N. F. C. Engineering Company. Clockwise: "Carpet-mates" furniture caster, capable of withstanding compression loads up to 3,500 pounds, molded of C-11 by Childlore Company. High-gloss, easy-clean meat grinder bowl molded for Nutone Company by Meridian Plastics, Inc. High voltage TV chassis socket molded by Breyer Molding Company for RCA. Lubricating oil sight-glass bowl undergoes 1,200 psi pressure, with C-11 molding by Cheney Plastics, Inc. for C. A. Norgren Company.

strength... BAKELITE C-11 BRAND

Plus—

- ★ Exceptional Chemical Resistance
- ★ Molding Accuracy and Wide Latitude
- ★ Smooth Finish
- ★ Good Dielectric Properties





The strength properties of BAKELITE Brand C-11 are unmatched by ordinary polystyrenes. An acrylonitrile-styrene copolymer, C-11 offers flexural and tensile strength and shock resistance plus exceptional chemical and high heat-resistance characteristics. These make it ideal for applications demanding surface hardness, dimensional stability and rigidity in service.

Specific data and technical publications on C-11 are available on request to your Bakelite Company representative or by writing Dept. MP-25.

TABLE OF PROPERTIES (RMD-4511)

Values Relating to Fabrication

Specific Gravity (D792-50)	1.07 (Varies slightly with color)
Weight per Cubic Inch (Molded) gms.	17.5
Bulk Factor (D1182-54) Diced	1.98
Pellet	1.71
Molding Shrinkage (D955-51), in./in.	0.004

Values from Mechanical Tests

Izod Impact Strength (D256-54T) ft.-lb./in. of notch	
⅛ in. thick	0.55
¼ in. thick	0.45
Tensile Strength (D638-52T), psi	12,000
Elongation in Tension (D638-52T), per cent	3.2
Flexural Strength (D790-49T), psi	17,300
Modulus of Elasticity in Flexure (D790-49T), psi	5.2×10^5

Values from Miscellaneous Tests

Heat Distortion Temp. (D648-45T) (¼ in. thick, 264 psi) deg. F.	200
Thermal Coefficient of Linear Expansion (D696-44) per deg. C.	7×10^5
Water Absorption (D570-54T), per cent gain in weight in 24 hours	0.23
Rockwell Hardness (D785-51)	M83

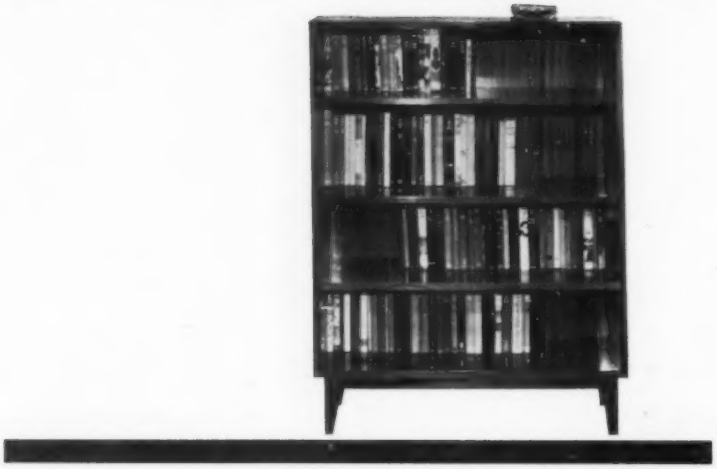
BAKELITE PLASTICS
BRAND

VINYLS
EPOXIES
STYRENES
PHENOLICS
C-11 STYRENES
POLYETHYLENES
IMPACT STYRENES

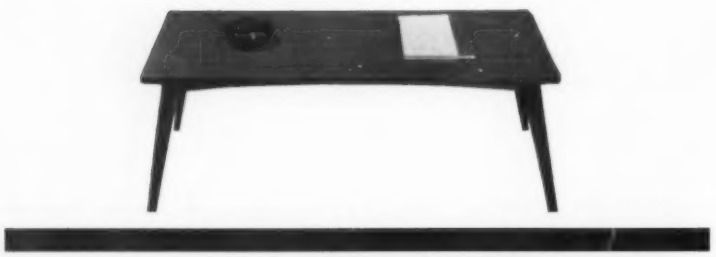
Products of UNION CARBIDE *Corporation*

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.
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8-1025







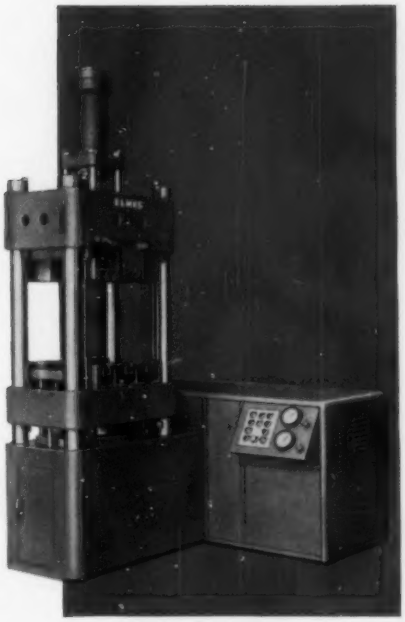




Bartrev Particle Board was used as a core material in this furniture designed and built for the *U.S. Forces stationed in Great Britain*. Off-cut wastage was eliminated because the *continuous production* process enables the required lengths to be cut automatically during manufacture. Pinned or glued, veneered or painted, it can be used in a number of ways with various textures and surfaces.
International Plastics Ltd.,
3 Vere Street, London, W.1,
England.

BARTREV

Turn your pressing problem into a *profit operation* with an



ELMES

"Job-Fitted" HYDRAULIC PRESS

COMPRESSION AND TRANSFER PRESSES

(For Plastics and Rubber Molding)

Pushbutton controlled, with semi-automatic time dwell cycle. Extra-large die space. Wide versatility; maximum operating ease and safety; adaptable to virtually any job. Standard capacities from 50 to 1000 tons. Special design as needed, in any required capacity.

Hundreds of manufacturers have called on Elmes to help solve production problems involving pressure application. It's no secret that Elmes engineering is pre-eminently qualified to provide this profit-making service — to recommend *the right press for the job.*

It will pay *you*, too, to call in Elmes on your pressing problems. Maybe your answer is in one of the many standard Elmes® designs, either "as is" or with simple modification. Or, if your requirements are special, Elmes will develop a "custom-built" press to fit your needs *exactly*. This special-design function has long been an important part of Elmes' service to industry.

In any case, you'll be wise to take advantage of engineering knowledge, skill, and foresight backed by more than 60 years of leadership in specialized hydraulic service. Recommendations and cost estimates promptly supplied. See your Elmes Distributor, or write us direct.



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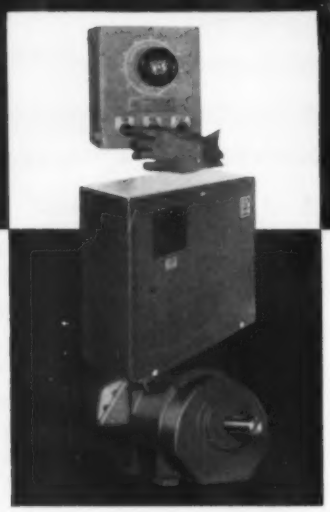
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ENGINEERING DIVISION

1159 Tennessee Avenue, Cincinnati 29, Ohio

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Photo courtesy Radix Wire Co.



V•S DRIVES MAINTAIN EXTRUDER OUTPUT SPEEDS

EXTRUDER speed regulation can be automatic. Once output speed is selected, a V•S Drive will hold the speed with varying load conditions.

V•S Drive Motors do not run away as the extruder warms up. Set extruder speeds are maintained from cold starts, up to hot operating temperatures. Extruding rate is constant and product quality uniform, all day long.

V•S Drives give more flexibility to an extruder. With the wide speed range of a V•S Drive, a single extruder can accommodate a variety of materials and dies. Speeds may be adjusted manually at any time, without stopping the extruder. Acceleration rates are regulated, protecting the screw from damaging fast starts.

Remember to specify Reliance V•S on your next extruder.

For further details, contact your Reliance representative, or write today for Bulletin No. D-2311. D-1588

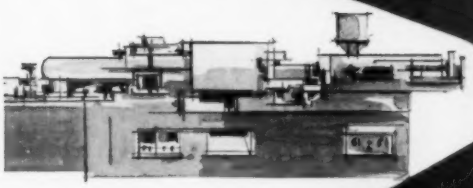
RELIANCE ELECTRIC AND ENGINEERING CO.

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before any formulation of FOSTARENE is recommended to you, it is first *performance-proved* in actual molding production. *Proved* for color brilliance . . . *proved* for color permanence . . . *proved* for moldability and economy

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FOSTARENE® is the polystyrene with this difference: proof of performance plus personalized service. And what a difference it makes in cutting costly rejects! Investigate FOSTARENE for your molding operations.

FOSTARENE®
STYRENE PLASTICS

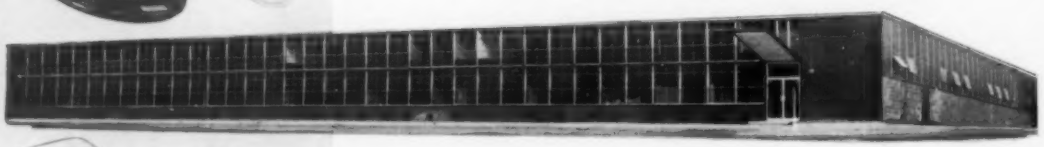
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Binghamton, New York:

New York State manufacturers now enjoy the added convenience of this new addition to our injection molding facilities. Twenty thousand square feet of floor space, seven modern injection presses, new dimensions in decorating and finishing—all these and a sound organization, too, are right on the spot to serve you better.



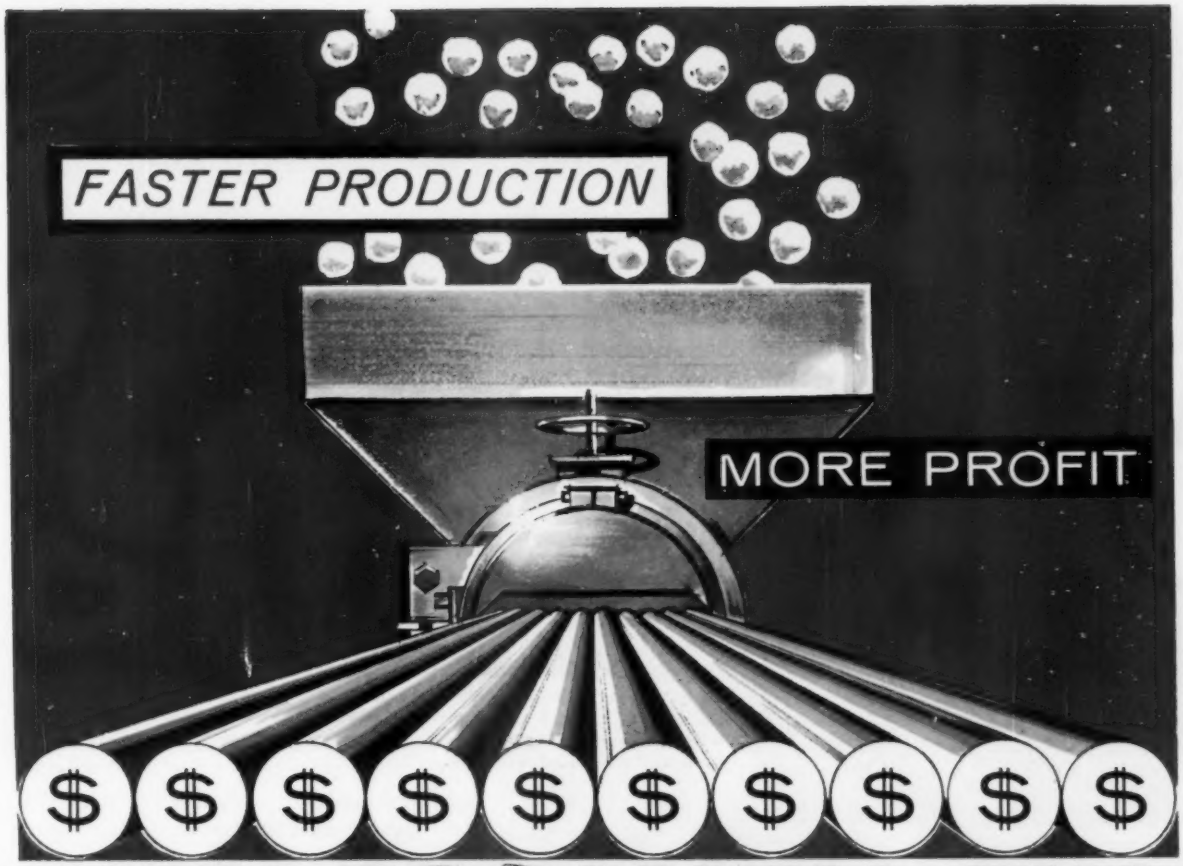
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CONSOLIDATED MOLDED PRODUCTS CORPORATION

Scranton, Pa. and Binghamton, N.Y.



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FASTER EXTRUSION RATES WITH DRY BLENDS FROM YOUR PRESENT EQUIPMENT MEAN MORE PROFIT FOR YOU....

. . . And speed is *only one* of the outstanding advantages you get from Escambia's NEW PVC PEARLS at no extra cost—



Competitive PVC *Escambia PVC Pearls*
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Manufactured in four molecular weights for all general purpose and many specific operations.

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Portable warehouses 4 stories high . . .



An all-weather "Airhouse" of U. S. Rubber Fiberthin vinyl-coated nylon is manufactured by Irving Air Chute Co., Inc., Lexington, Ky. Thermatron generators and presses are used to weld the seams of the structure which is supported entirely by air pressure. At left an "Airhouse" is shown before inflating.

supported by air and **THERMATRON** *electronic welding*

No rigid wood or metal framework supports these unique houses — just a thin shell of vinyl-coated nylon and low pressure air. Part of the secret of Irving Air Chute's seemingly impossible "Airhouse" is the airtight, watertight seams permanently welded on Thermatron high frequency presses and generators.

Thermatron welding gives added strength to plastics—seams are actually stronger than the material itself! What's more, it's fast and economical, particularly important in such large scale applications as the "Airhouse," hatch and aircraft hanger protective covers and swimming pool liners.

High frequency plastic welding isn't limited to giant items—Thermatron is a vital cost-cutting, product-improving factor in the fabrication of toys, upholstery, clothing, luggage, automotive assemblies and many other plastic products. In fact, if you fabricate vinyl plastic in any way, Thermatron can point the way to faster and better production methods.

We'll be glad to make tests on your own material and offer suggestions without obligation. Write today to Section MP-3.



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SUBSIDIARY OF GENERAL INSTRUMENT CORPORATION

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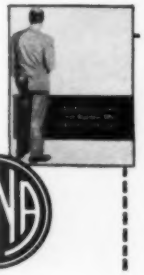
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KOPPERS COMPANY, Inc. uses NRM *Thermoplastics* EXTRUDERS

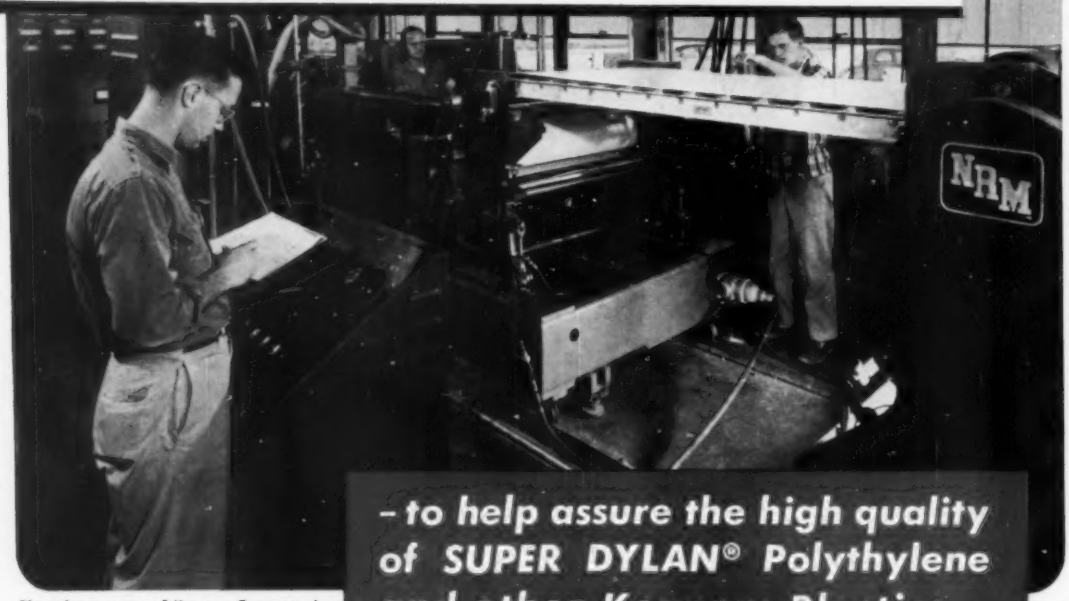


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– to help assure the high quality of SUPER DYLAN® Polythylene and other Koppers Plastics

Super Dylan polyethylene and Dylene® polystyrene are names so well known in the plastics industry it's hardly necessary to say that they are polyethylene and polystyrene compounds produced by the Koppers Company, Inc., of Pittsburgh, Pa. Both have special characteristics which make them outstanding in their field, and both have one thing in common . . . their formulations are tested for quality under actual production conditions in Koppers laboratories with NRM Thermoplastics EXTRUDERS and Accessory Equipment.

This view shows 36-inch high impact polystyrene sheet being extruded in Koppers Development Laboratory on an NRM Rigid Sheeting installation. This type of equipment is available from NRM for production of rigid sheet in most commercial widths. Complete installations include: Extruder and electric controls, Sheeting Die, Polishing Rolls, Conveyor, Draw Rolls, Power Shear and automatic Stacker.

There are many reasons why Koppers Company, Inc., and other leading plastics producers the world over choose NRM Extruders and Accessories. Just a few are: low operating cost at minimum maintenance; the ability to produce consistently close-tolerance extrusions of high quality and fine finish, and high output rates over a long service life.

If *you* are planning to purchase plastics extruders and accessories, we'll be happy to discuss your requirements and recommend the right type and size NRM Extruders with matched dies and accessories to do your work most efficiently and *profitably*. No obligation, of course. Contact us today.

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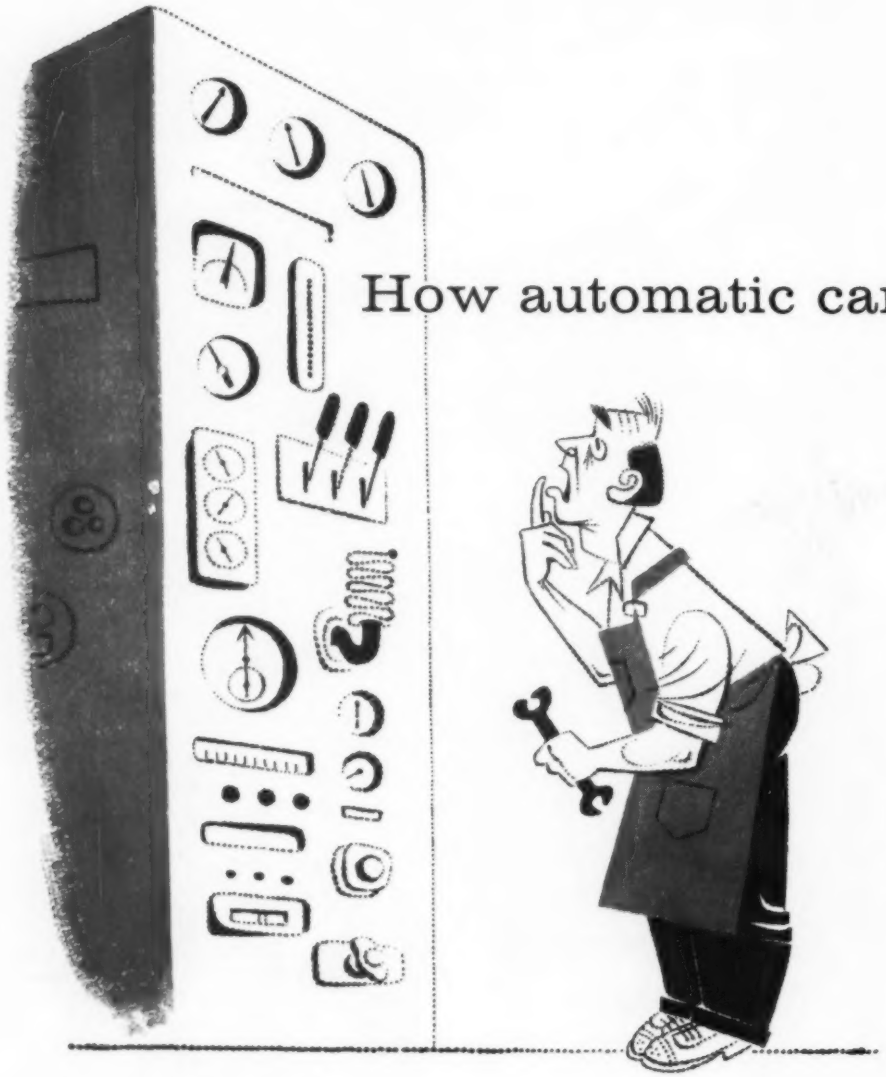
By the makers of Sunolith Lithopones . . . Euston White Lead . . . Resistox Copper Pigments

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In plastics molding, for example, there are all kinds of automatic presses, attachments, and gadgets that do all kinds of things. Machines will probably be able to analyze a problem, select the materials, equipment, and cycles, sometime, but today that must be the molder's responsibility.*

And automatic machines can't even handle some molding jobs—if delicate molded sections, inserts or similarly tricky problems are involved. So a molder has to keep all kinds of equipment in his plant, just as we do.

Oh, we're up-to-date at Boonton all right. We're as automatic as you can get. But as good as automatic equipment is—somewhere along the line it leaves off . . . and that's where our thirty-five years of custom molding experience comes in pretty handy.

* *And we are responsible molders, of course.*

BOONTON MOLDING CO.

BOONTON, NEW JERSEY

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There's always a job for a Wood Press... and a Wood Press to do the job

When you want a production shortcut—or downtime and costs need cutting—there's a job for a Wood Press. And in almost every type of plastics or rubber operation, there's a Wood Press to do the job. R. D. Wood builds presses for such jobs as molding, curing, laminating, polishing and processing—besides designing and constructing others for special work. All have three things in common: sound design, carefully selected materials, conscientious workmanship. As a result, R. D. Wood Presses consistently deliver the utmost in smooth, dependable performance; fast, economical production; trouble-free operation. Write for catalog and engineering information—without obligation.



1200 ton, self-contained, multiple opening platen press. Designed for processing rubber and plastic sheets. Six openings, platen size 42" x 42". Send for complete details of this and other R. D. Wood Presses for the plastics and rubber industries.



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3M Chemicals opening new worlds of use for plastics



Final step in making die of 3M Brand Tooling Compound 112—preform of treated metal powder is set in liquid resin for impregnation and cure.

NEW compound cuts die costs 50% to 90%

Now, with 3M Brand Tooling Compound 112, there's no more time-wasting weighing or mixing . . . no more pot-life or toxicity problems that go with conventional plastic tooling compounds.

And there's no waste of materials, either! You pour only as much aluminum powder and resin as you need; return excess of each to its container. The result: big savings in time and materials that actually cut die-making costs from 50% to 90% below the cost of metal dies.

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The preform is cured in liquid resin for 12 to 16 hours. The resin soaks in uniformly to provide a dense, uniform, durable die with high-temperature performance and strength to withstand high-speed production.

All sizes of tools can be made from Tooling Compound 112. Because of their high heat conductivity and stability they are easily machined, wet-sanded or buffed. Tooling Compound 112 is ideal for making compression-molding and vacuum-forming tools. And it is being used successfully to make injection molds and tools for rubber molding and metal-to-metal bonding.

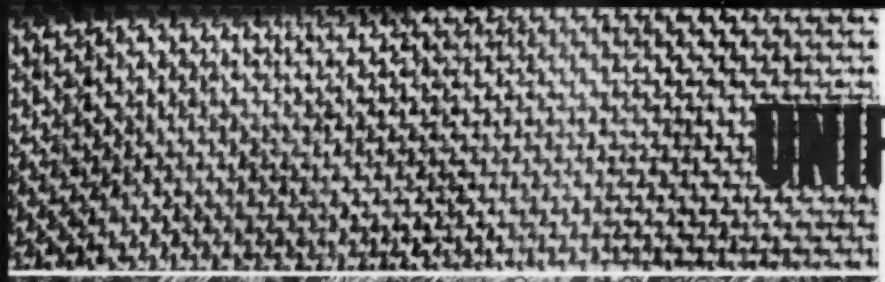
Cut die production costs through savings on tooling materials and time. Switch to Tooling Compound 112 now! For full data, write: *3M Company, Dept. WQ 38, St. Paul 6, Minnesota.*

Hastings Chemical Division • Chemical Products Group

MINNESOTA MINING AND MANUFACTURING COMPANY

. . . WHERE RESEARCH IS THE KEY TO TOMORROW

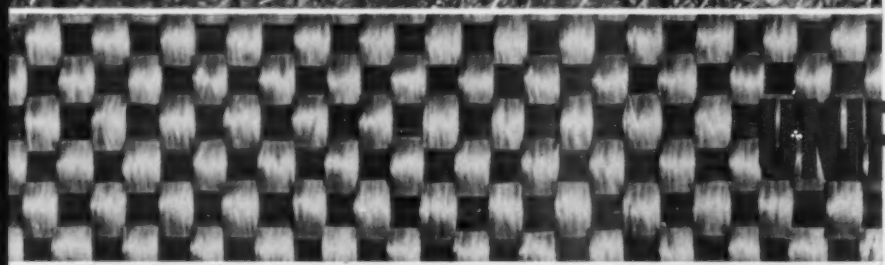
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UNIFAB
reinforcing
fabric . . . . . and tape



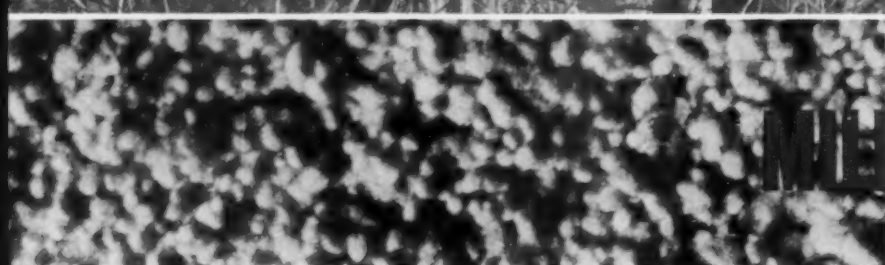
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reinforcing mat



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woven roving



Ferro
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Ferro
MILLED FIBERS

Ferro fiber glass reinforcements for plastics . . . each with uniformity that always conforms to your "specs"

Your every order of Ferro fiber glass reinforcements must check out to Ferro's high-quality standards at every stage of production. Each item of your order must conform to your "specs", or we don't ship! This is the best way we know to guarantee you *uniformity* — to help you end production and sales problems caused by possible variations in your reinforcements.

Ferro produces fiber glass for one purpose only, the reinforcement of plastics. That's why we can work to such close specs, and hold them, day after day, in production.

Write for samples, prices, specifications, on Ferro's complete line of fiber glass reinforcements.

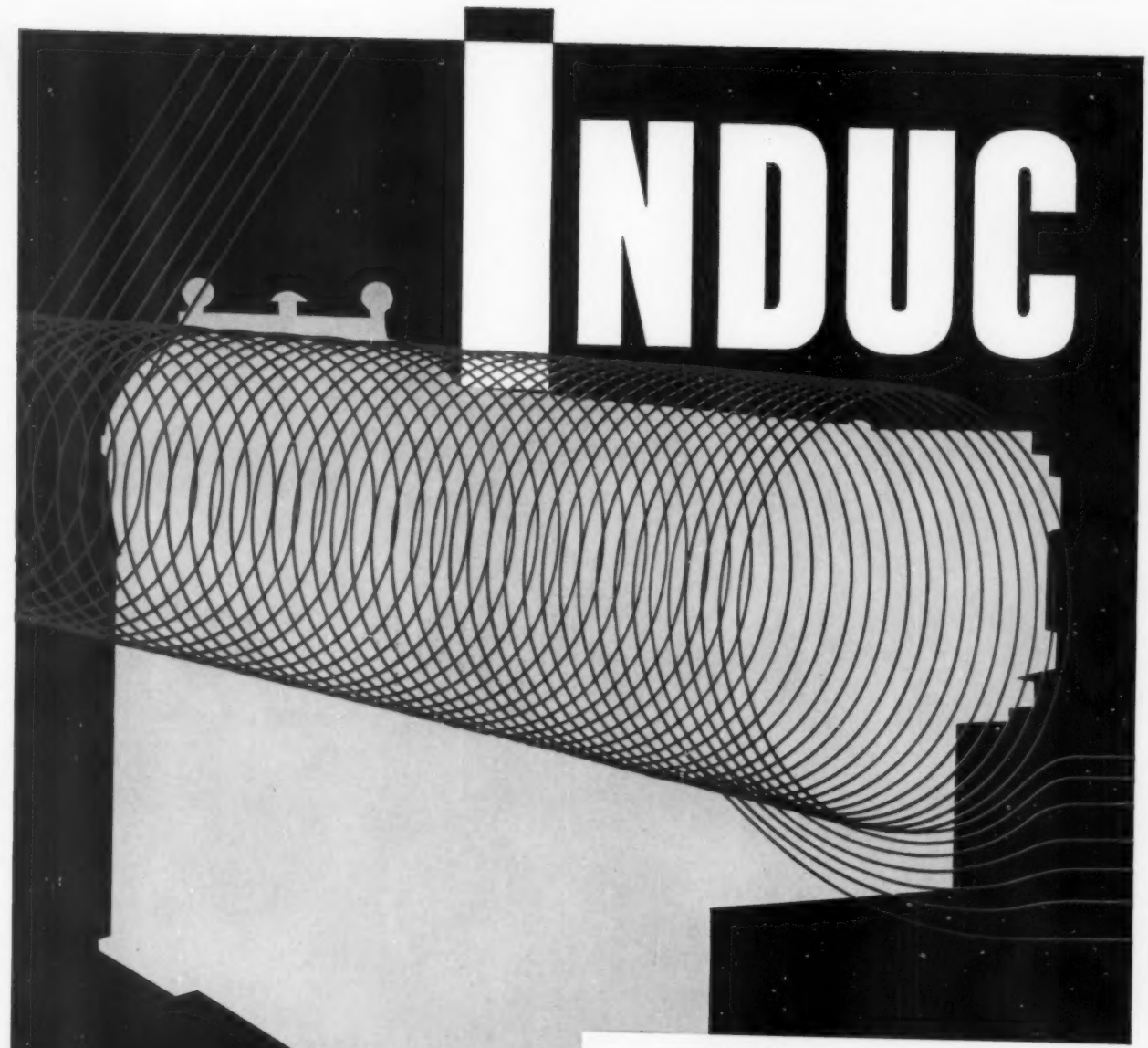
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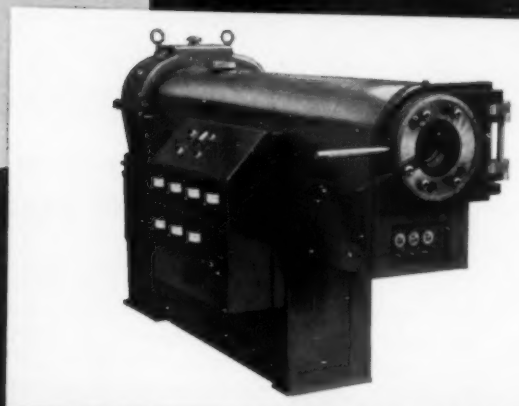
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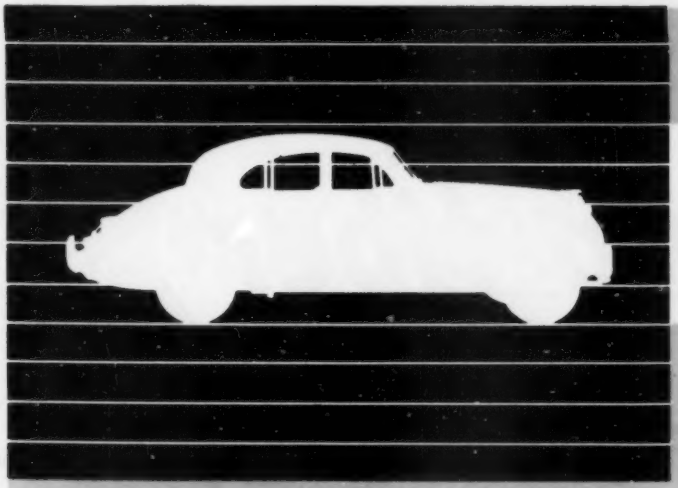
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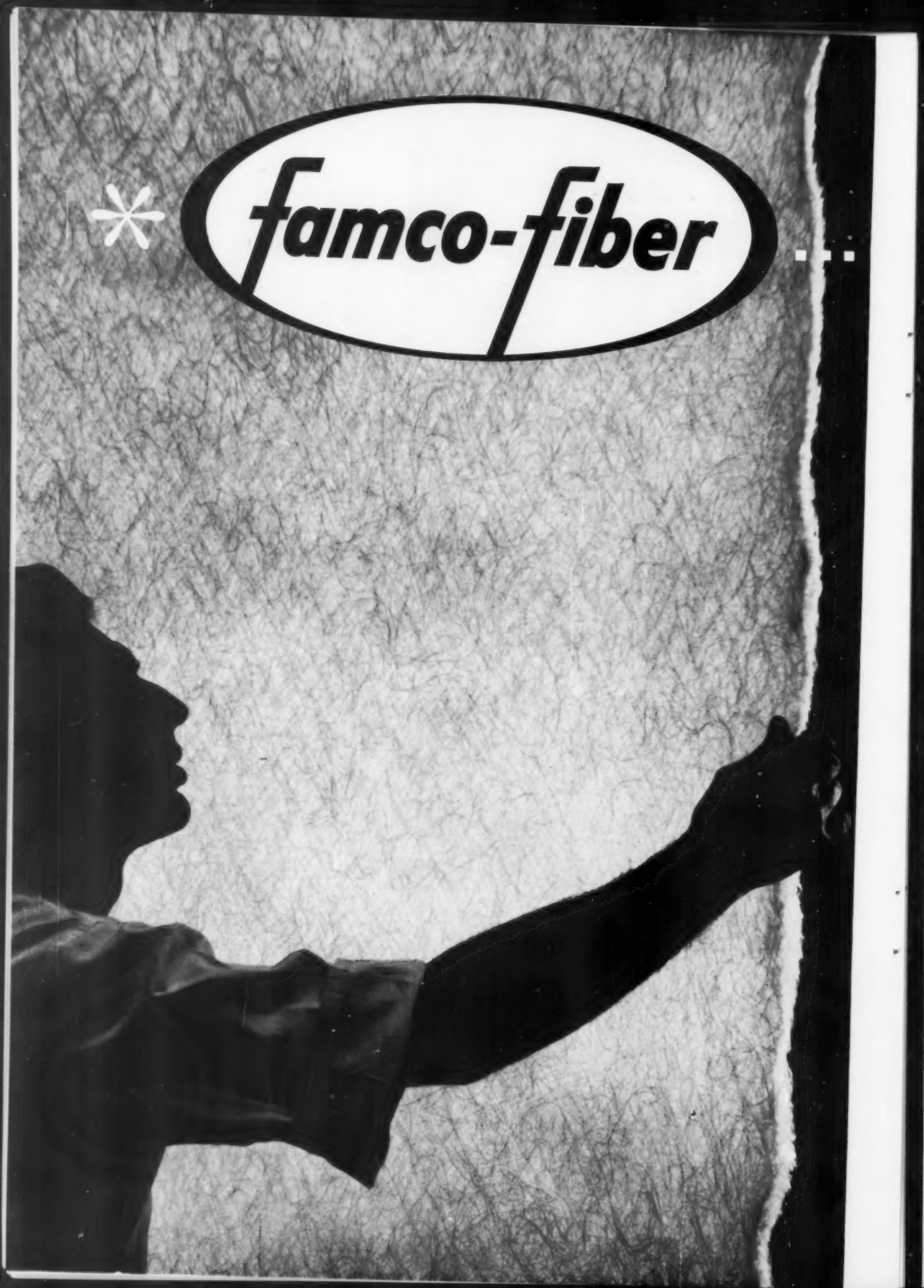
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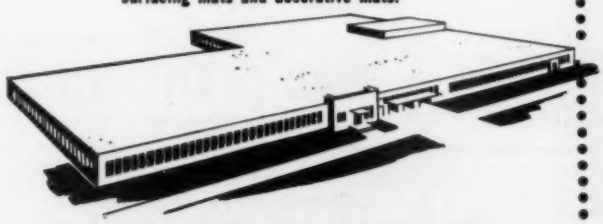
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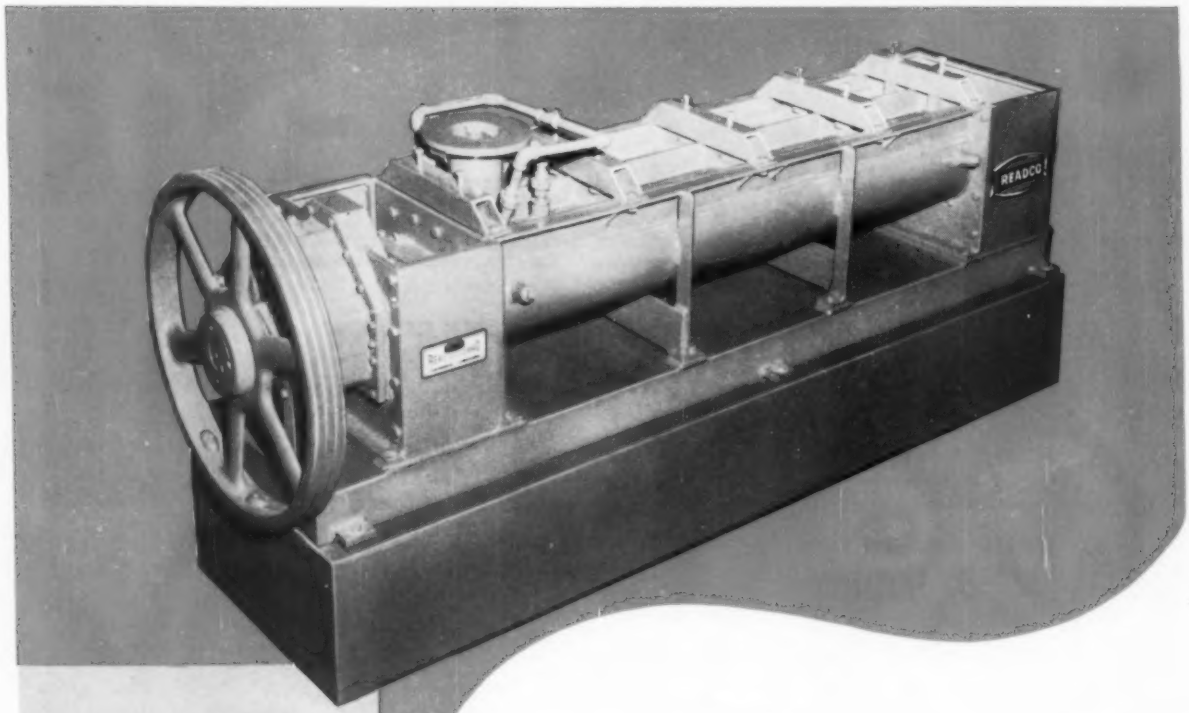
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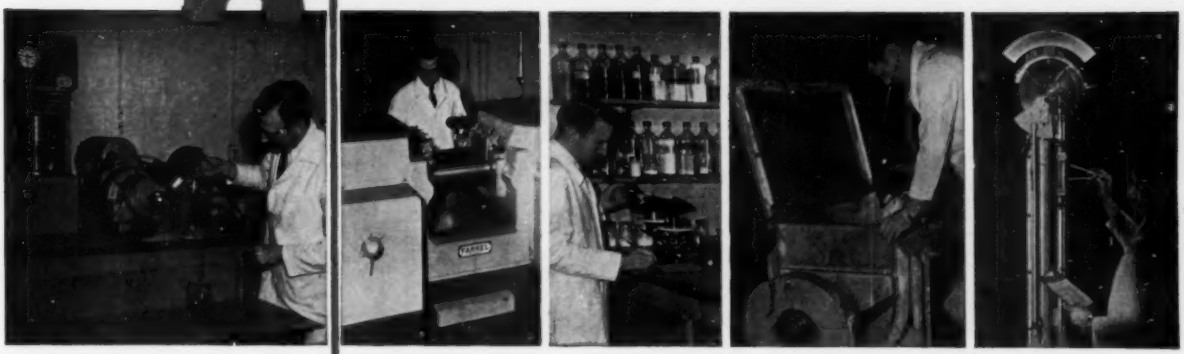
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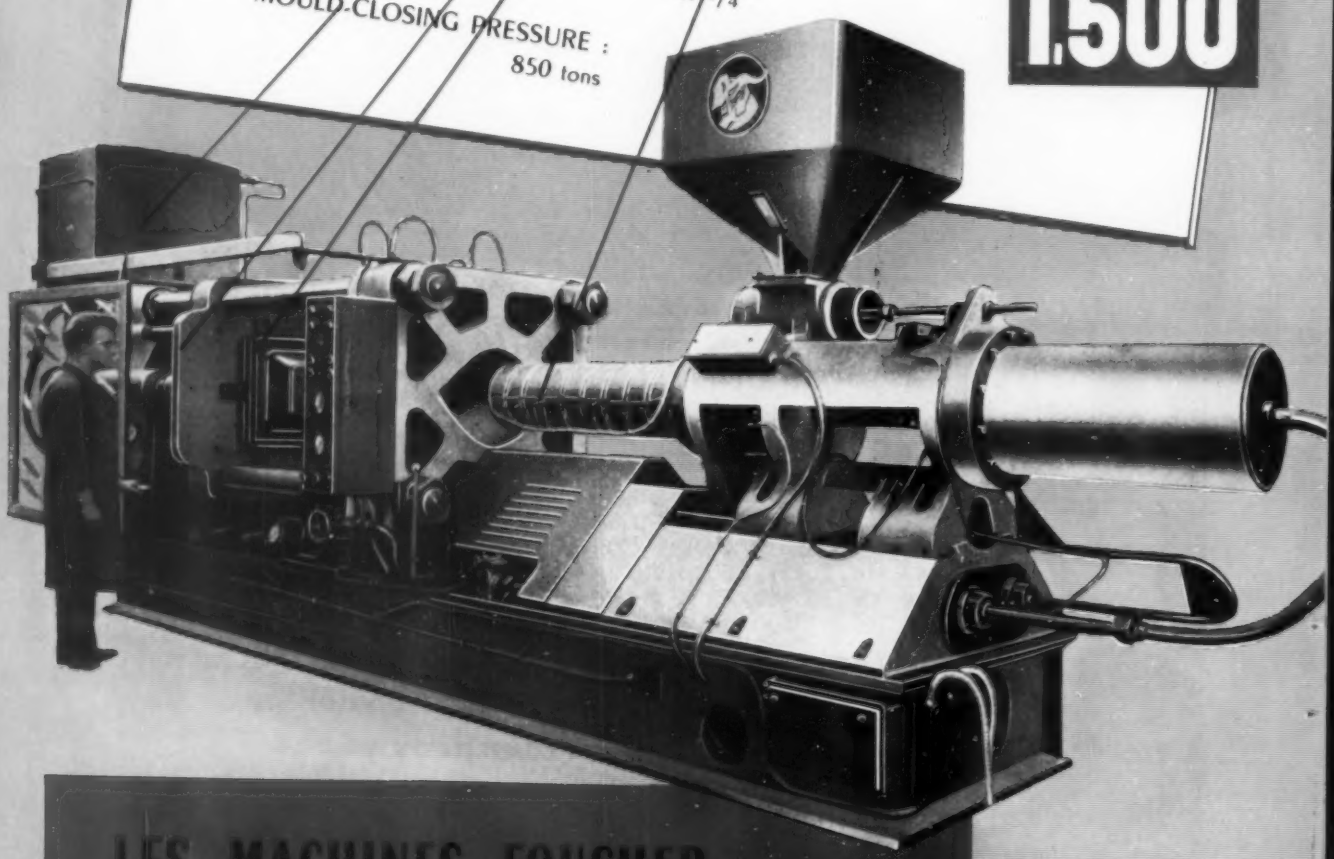
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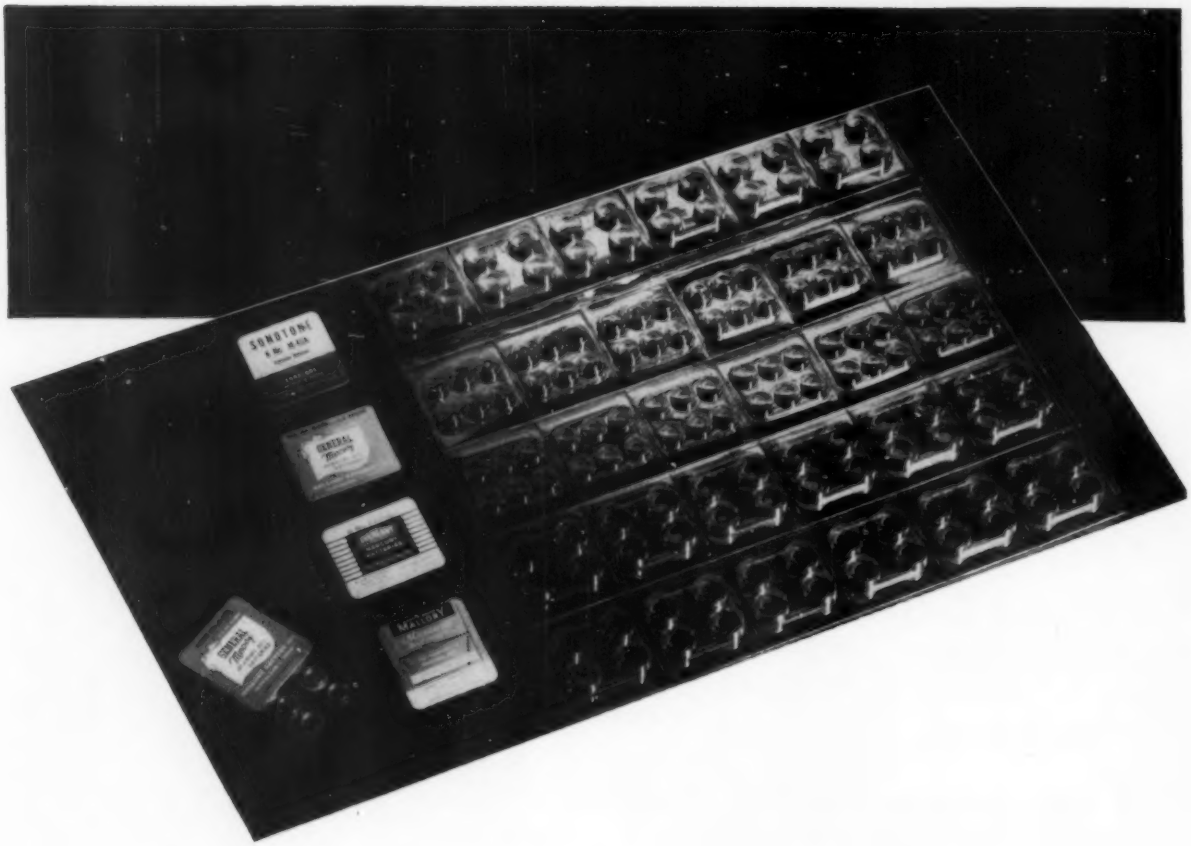
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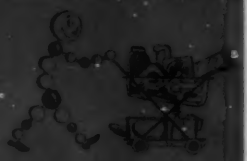


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Don't miss . . . in this issue

The first feature on polypropylene. Here is a new plastic soon to become available in quantity. It has superior properties lending it to a wide variety of applications. Where will it compete? What are the design factors involved? Is it difficult to mold? These questions are answered at laymen level in the article "What's with polypropylene?" p. 89.



How heat-sealing works. The dielectric sealing of films of vinyl and other polar resins has become a very big business, but the technical aspects are not generally understood. This article answers questions about the basic circuit relationships involved and where heat-sealing equipment and techniques stand today. See "Electronic heat-sealing," p. 109.

The article on how, why, and when to use reinforced thermoplastic molding materials. These compounds, a development of the past five years, have brought to certain strategic types of applications not only more precision in component size but greater strength and speedier production. See "How and why to use glass-reinforced injection molding compounds," p. 100.



An important analysis of polyolefins and their present technical status. How far can polyethylene, polypropylene, and butene-1 go in improved end-use properties—within limitations of processing requirements? A three-dimensional map, whose coordinates are molecular weight distribution, density, and melt index, provides a framework within which resin potential and limitations can be evaluated. The map also makes it possible to predict which of any given olefin homopolymers may turn out to be a good plastic. See "The polyolefin plastics field," p. 125.

New opportunities in extrusion. Here are the details on how a radio manufacturer used a simple L-shaped extrusion to produce a low-cost cabinet for a transistor radio. The economics were such that the maker was able to use a fairly expensive material, thereby gaining in the strength properties of the housing. See "Extruded radio cabinet," p. 93.



What's new in plastics in electronics? Since computers, satellites, and missiles depend on electronics, since circuits have become more complicated, and since space limitations for electronic elements have become more severe, plastics have taken over the dielectric field. The latest developments involve a variety of plastics with a broad range of physical, chemical, and electrical properties. The latest industrial revolution—brought about by automation—is bringing about spectacular growths of plastics usage. See "Electronics: miracle market for plastics," p. 81.



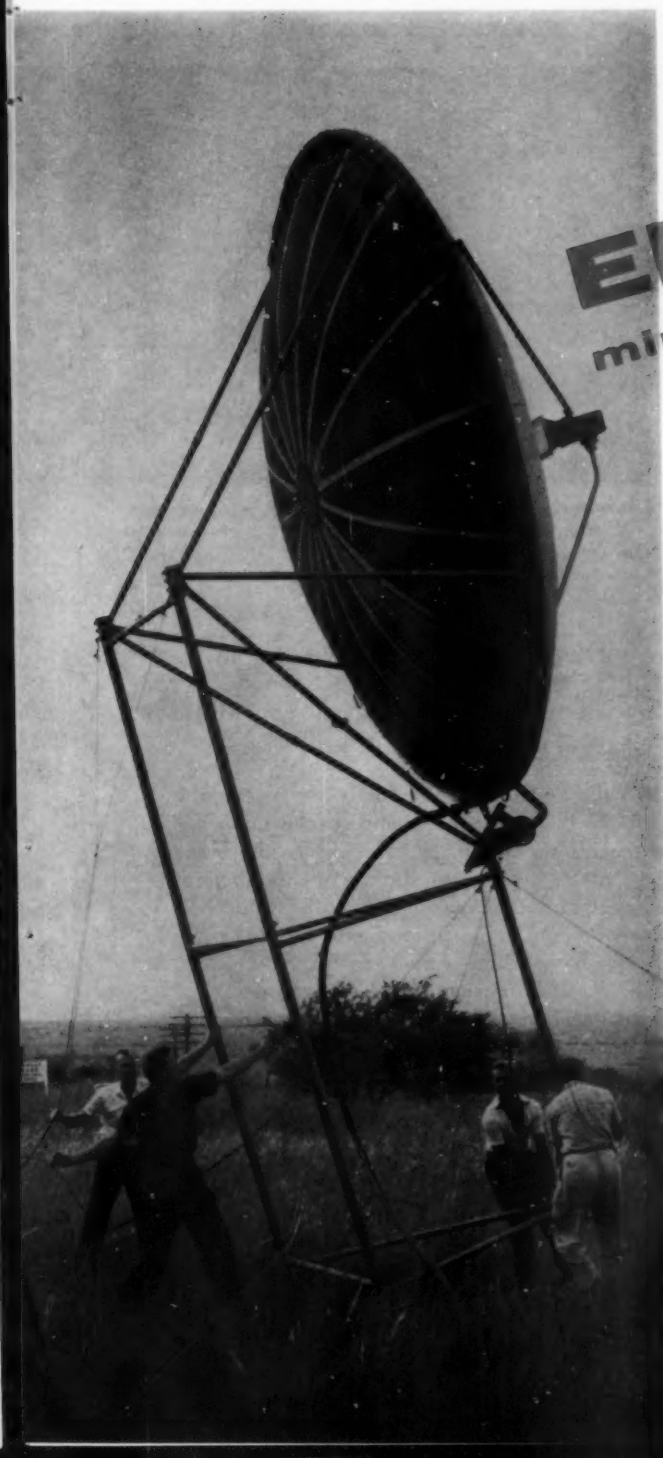
The second half of the article on shrinkage of thermosets explores differences in coefficients of thermal expansion in the flow direction and the vertical (force) direction. The authors show how shrinkage factors for mold design can be reliably determined and they have demonstrated that the ultimate dimensional reproducibility of current compression molding methods is about 1 mil/inch. See "Molding shrinkage," p. 117.

Two new polyester films. These films, with a combination of properties claimed to be unlike those of any previous material, are a laminating film for surfacing plastics and non-plastics materials and a heat-sealable, shrinkable film for packaging. Properties are declared to include good outdoor aging, resistance to abrasion, ease of forming, and stretch-laminating. See, "A new polyester film in the limelight," p. 94.



Watch for . . . our April cover which is to be a thrilling presentation of the part which plastics play in modern agriculture . . . also in April a progress report on vinyl-metal laminates, the kinds available, methods of using them, and their most recent volume applications . . . a closer look at polycarbonate resins, a new thermoplastic with interesting properties; applications include gears, coil forms, cams, and other industrial parts . . . an article on the latest details on methods of molding high-density polyethylene . . . the story of plastics in tarpaulins, air-houses, and the "Dew line" structures . . . a special report on new methods of machining Teflon . . . a survey of market potentiality for wood-filled urea . . . a round-up of tricks and gimmicks in mold design . . . more articles in the series on the economics of extrusion . . . an analysis of the use of plastics in our more important missiles . . . and continuing detailed information on new materials and methods you can use for profit!

MODERN PLASTICS
Volume 35
March 1958
Number 7



Electronics: miracle market for plastics

No aspect of the plastics industry is more exciting than its growing role as a supplier of both materials and ideas to the electronics industry

The first industrial revolution, based on the steam engine and steel, freed man of his dependence on his own muscles. The second industrial revolution, powered by electronics and dependent largely on plastics, will extend man's senses and brain power beyond all past experience. Automation, missile warfare, computer-type office machinery, space travel, and industrial, medical, and household devices by the score—all of them depend in large part on the speed and infallibility of electronics.

The plastics industry's stake in electronics and related electrical goods is already high. An estimated 70 million lb. of polyethylene were used in wire and cable insulation during 1957, for example. Another 89 million lb. of vinyl chloride went to the same use. Electrical de-

Vinyl-coated fabric forms housing of new u.-h.-f. antenna; metallized Mylar film serves as reflecting element. (Photo, Collins Radio)

vices consumed an estimated 85 million lb. of phenolic molding powders, including 2 million lb. which went to the tiny resistors and capacitors that form part of every electronics circuit. Radio and television alone accounted for over 10% of all the custom molding, both compression and injection, in the United States. And this is just the beginning.

Miracles in plastics

The dramatic postwar growth of the electronics industry, now the country's fifth largest with factory sales of over $7 billion last year—up 500% in a decade—has been accompanied by an equally dramatic increase in the use of plastics as an electronics raw material. Molded plastics have captured, for example, the market for table-radio cases, of which nearly 15,000,000 were sold last year. The most important changes, however, have been in the electronics circuitry itself.

From the beginning, the electronics engineer has traditionally designed his circuits on paper, and attempted to duplicate the lines on his schematic drawing with simple wire connections. This was fine when the circuits were relatively simple and the radio frequencies low. But as the devices have grown more complex, with higher frequencies and more severe limitations on weight and size, the electronics engineer has found that conventional wiring would not do the job. If new electronic marvels were to get off the drawing board and into reality, new fabricating techniques and concepts had to be developed.

The result is the emergence of a new expert, the electronic "packager." Electronics hardware design and fabrication is no longer a job for solder-jockeys; instead, it requires all the skill and knowledge of individuals familiar not only with electronic circuits, but also with a wide range of manufacturing methods and materials.



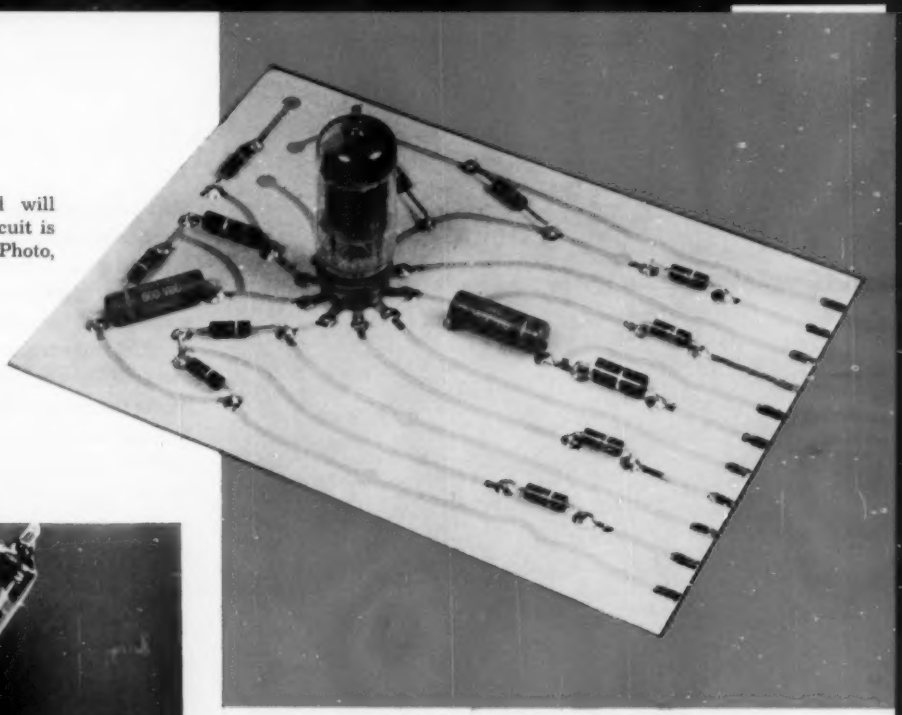
"Windows" for microwaves are provided by polyester-glass radomes; one type is shown above under inspection. (Photo, Haveg Corp.)

To these specialists, almost every packaging problem is specific, requiring special materials or techniques of fabrication. No medium other than plastics provides such a wide range of product specifications and handling methods. Moreover, in the plastics industry the electronic experts have found—among material suppliers, molders, and fabricators alike—an alert, research-minded community willing to experiment, and if necessary to try the impossible.

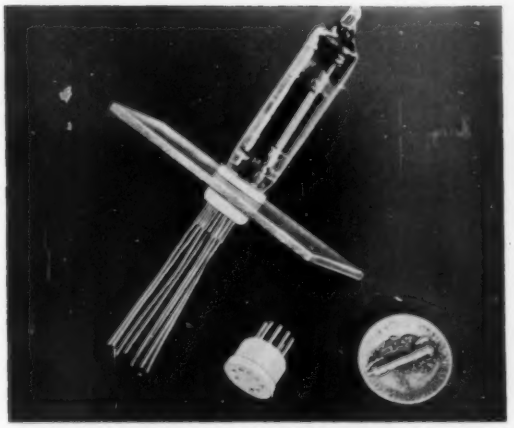
The most obvious contribution of plastics to electronics is the printed-circuit board. Few innovations have so drastically changed the



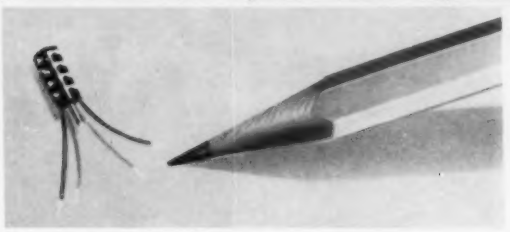
Complex circuitry for electronic organ is printed on phenolic laminate which supports and insulates. (Photo, Formica Corp.)



Synthetic mica circuit board will withstand high temperatures. Circuit is silk-screen printed in silver ink. (Photo, Mycalex Corp. of America)



Subminiature tube socket molded of Teflon is mounted by simply pressing into hole in chassis. (Photo, Fluorocarbon Products, Inc.)



Maximum dielectric strength in minimum space is achieved with thin-wall Teflon wire insulation. (Photo, Thermax Wire Corp.)

physical appearance of an industry's products as this single development. And in its wake have come a great variety of new style components, assembly techniques, and design concepts.

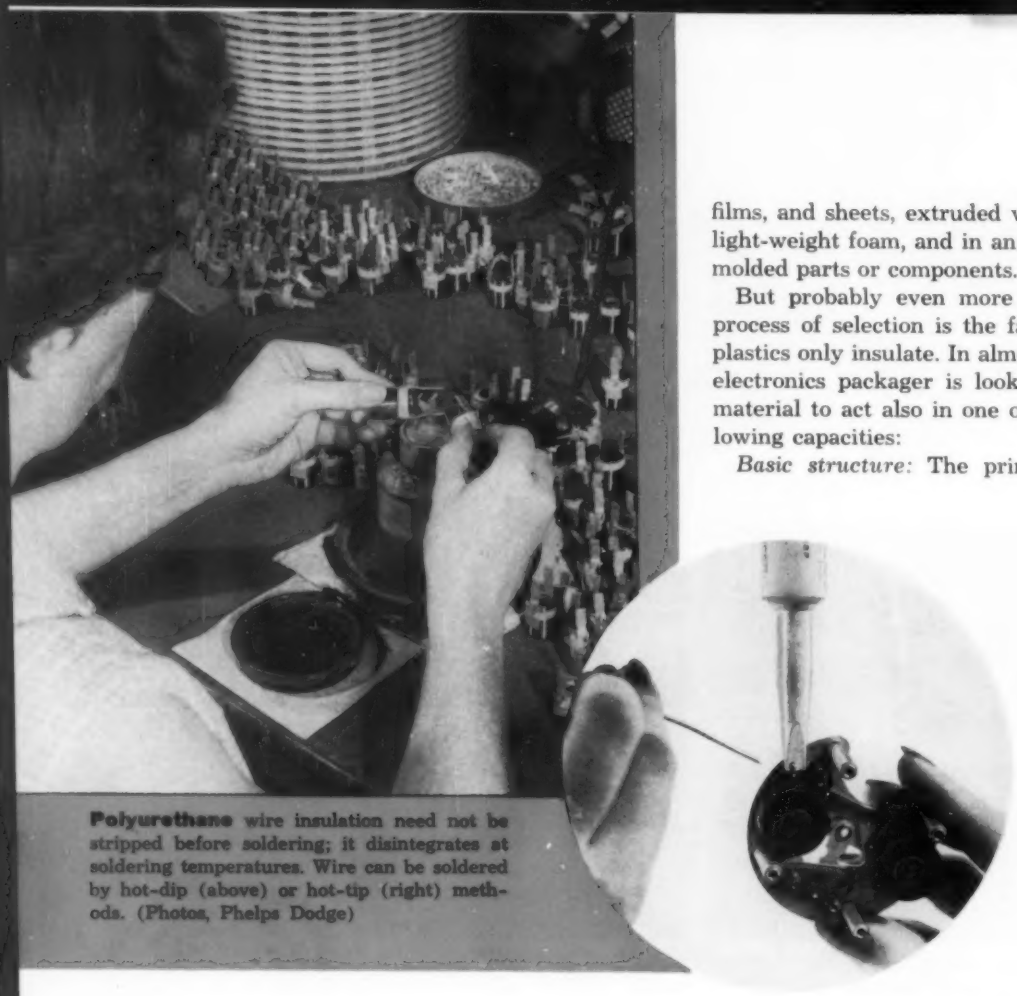
Plastics are reshaping electronics, however, in a number of other ways. McDonnell Aircraft Corp., St. Louis, for example, has long been installing radio equipment containing potted components and subcircuits. By applying the same technique in the assembly of an aircraft's electrical system, the company has made important weight savings in every aircraft it produces. Another example: a two-part polysulfide material compounded by Products Research Co., Los Angeles, is used to waterproof and secure wire leads in bulkhead connectors, eliminating the need for at least 60 lb. of grommets, clamps, and back-up plates per plane.

Equally dramatic results can be found in the new collapsible u.-h.-f. trans-horizon antenna designed by Collins Radio Co. for evaluation by the U. S. Army. Similar in concept to the Para-balloon radar antenna built by Westinghouse Electric Corp. (see MODERN PLASTICS 34, 98, Aug. 1957), the new antenna is made up of two glass-reinforced vinyl fabric "dishes" joined at the rim (photo, p. 81). One parabolic dish, acting as the antenna reflector, is laminated with aluminum-metallized Mylar; the other dish is transparent to the 1000-mc. frequencies used. The unit, inflated and held upright by a simple metal frame, has withstood winds of over 50 miles per hour. Dismantled, the antenna requires only 2 by 3 by 7½ ft. for storage. Its total weight is 400 lb., compared with 1350 lb. for an equivalent metal antenna.

Channels for electronics

The principal role of plastics in electronics is to act as the insulating or dielectric element.[1] This is its function when it is used as a covering for cables or wires, or as a nonconducting base

[1] For a tabulation of the electrical properties of plastics materials, see MODERN PLASTICS Encyclopedia Issue, Sept. 1957, "Plastics Properties Chart," facing p. 554. See also the following pages in the same issue: 116, 119, 151, 167, and 733.



Polyurethane wire insulation need not be stripped before soldering; it disintegrates at soldering temperatures. Wire can be soldered by hot-dip (above) or hot-tip (right) methods. (Photos, Phelps Dodge)

material for printed circuits, or as the separating element in a capacitor.

This insulating role is becoming more important every year. Originally, electronic circuits consisted simply of wires connecting components, with air as the principal dielectric material. Wires and components that might touch each other were insulated with cloth, varnish, or wax, but most contacts and terminals were left bare. As frequencies and powers increased, however, and as the complexity of electronic assemblies has multiplied, insulation has assumed an importance almost equal to that of conductors. Indeed, many electronic assemblies are now simply solid chunks of insulating material, usually a plastic, in which are buried the individual components and connecting leads.

Making a choice

The sheer variety of methods by which plastics may be applied accounts in large part for the important role of plastics in electronics packaging. One single resin—polyethylene, for example—may be used in the form of tapes, films, and sheets, extruded wire coatings, as a light-weight foam, and in an infinite variety of molded parts or components.

But probably even more important in the process of selection is the fact that rarely do plastics only insulate. In almost every case, the electronics packager is looking to the plastic material to act also in one or more of the following capacities:

Basic structure: The printed-circuit board combines structure with insulation, and, on a smaller plane, plastics bobbins, spools, tubes, rods, and sockets serve the same purpose for electronic components.

Vibration dampeners and shock absorbers: Soldered joints pry loose, electro-mechanical moving parts jam, hair-thin wires snap. The vulnerable parts can be protected by a solid plastics shell or by "floating" in a vibration-absorbing plastics foam.

Waterproofing: Even a thin film of moisture, if it combines with dust, can shortcircuit a system or seriously impair its electronic performance. In addition, many pieces of military gear must be protected from long exposure to rain or sea water—and plastics can do this job in more ways than one.

Microwave absorption or transmission: Sometimes the insulating material must prevent stray microwave emissions from interfering with sensitive parts of the system. Polystyrene and polyurethane foams, filled with carbon black or metal dispersions, are often used in such applications. In other cases, as in radomes

(photo, p. 82), the same materials must form a perfect "window" for the passage of microwaves.

Temperature insulators: Most electronic components are temperature sensitive; plastics are widely used to isolate circuit components from exterior sources of heat. At the same time, care must be taken that an escape route is provided for heat generated by resistors, vacuum tubes, and other circuit elements, so that the efficient operation of the electronic equipment is not impaired.

Tapes

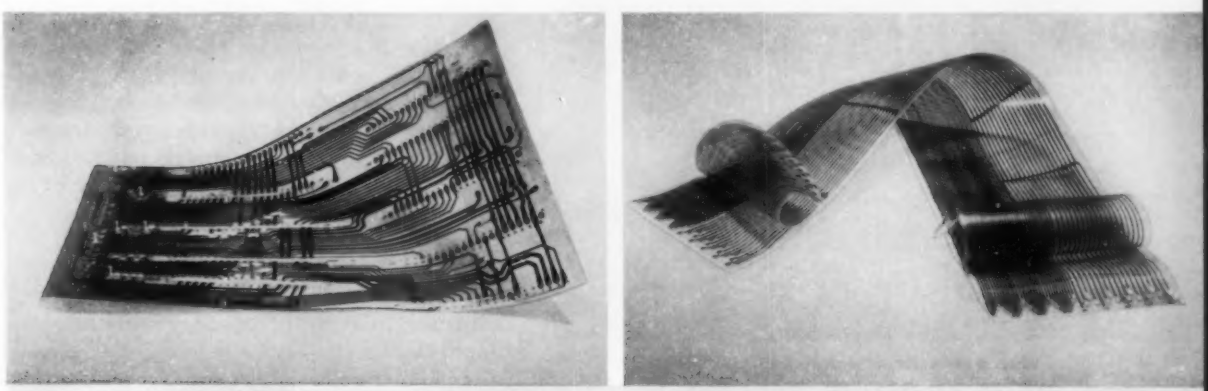
In the single field of plastics tapes there have been three recent innovations, each different, all significant to the electronics industry. One is an irradiated polyethylene cable wrap introduced by Illumitronic Engineering, Sunnyville, Calif. The tape, in varying widths, is first extruded, then irradiated. The resulting cross-linkage sharply increases the tape's heat resistance; it is reported to have successfully withstood a constant temperature of 150° C. and 270° C. for 48 hours. But, most important, the irradiation greatly reduces the tendency of the tape to cold flow, permitting polyethylene cable wrapping to be used in applications where dimensional changes cannot be tolerated.

Another important development which is finding widespread use is that of extruded vinyl zipper tape. Electronic packagers have had a problem in wrapping wire harnesses into cables, especially when the strands are in out-of-the-way-places within the circuit housing. Zipper tapes are continuous lengths of 0.020 gage or heavier vinyl. Channels are extruded along both edges, and an inside flap is heat-sealed along one side to help provide a watertight, airtight wrap.

To use the zipper tape, the electronic assembler simply cuts the desired length, attaches a small metal slide, folds the tape around the wires, and zips it shut. If there is no anticipated need to open the cable, adhesive is applied to the zipper channels to provide a permanent seal.

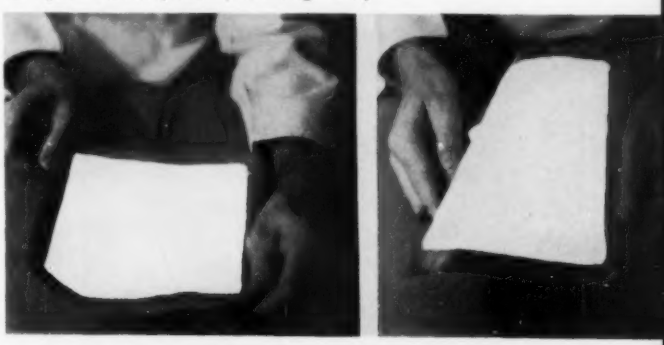
Zipper tapes are supplied by Alpha Wire Corp., New York; Pres Industrial Equipment Ltd., New Paltz, N. Y.; and the Zipper Tubing Co., Culver City, Calif.

The third new tape of significance is a flexible Ferrotron tape now being pro- (*To page* 207)



Flexible printed circuitry has etched patterns of conductors permanently bonded between thin sheets of fluorocarbons, polyethylene, etc., with connection provided where required. (Photos, Sanders Assoc., Inc.)

High efficiency is claimed for new flexible light source consisting of a phosphor coated on nylon sheet. (Photos, Westinghouse)



Eye allure



False eyelashes fabricated of vinyl-coated polyester film are applied with pressure-sensitive adhesive. (Photos, B. F. Goodrich)

Plastics materials in the past have often become involved in the creation of some truly unique products—but perhaps none as unusual as the plastics eyelashes illustrated on these pages. Yet, despite the apparent frivolity of the application, the "false" eyelashes represent the result of careful research into the characteristics of plastics materials and considerable ingenuity in adapting these characteristics to the solution of a specialized problem. Although it is true that this will never be a large-poundage application, readers of MODERN PLASTICS should find it an interesting case study in plastics usage—from the manufacturing steps right through to packaging and merchandising.

"... and the heroine demurely lowered her vinyl-coated polyester film eyelashes, showing off her delicately-tinted acrylic lids . . ."

Thus might a modern author describe the modern woman making use of one of the phenomena of modern cosmetics—false eyelashes for the female inadequately endowed by nature.

Cosmeticians have tried to tackle the problem of unsightly eyelashes in many ways and with varying degrees of success. But now, thanks to plastics, Campus Chimes Cosmetics Corp., New York, N. Y., feels that it has licked the problem once and for all. The Chimes plastic eyelash is exceptionally realistic looking and softer than natural eyelash hairs; it has outstanding durability and is reusable; it is light in weight and water resistant; its curl is unaffected by humidity; and, because of one-piece construction, there is little danger of its "hairs" falling off.

Choosing the right plastics

Because of its exceptional strength, polyester film was chosen as the base material. The color for the lash hairs—either brown or black—is printed on the film with Geon 121 PVC-based lacquer. After printing, the units are die cut from the film and the lashes formed by a mechanical slitting operation. Before curling, the lashes are rectangular in cross-section and measure about 0.0065 by 0.0012 inch.

The vinyl-based lacquer was selected because it will adhere permanently to the polyester film, its shrinkage in a later heat treatment can be accurately controlled, and its insolubility in aromatic solvents permits a subsequent treatment with acrylic lacquers.

Lashes are curled through heat shrinkage of the vinyl which is applied in different thickness to both sides of the film. During the same heat treatment the cross-section of the lashes is changed to an arc that imparts sufficient rigidity to the lashes to maintain their shape.

Because of the glossy surface of the polyester film, the lash hairs and lid—eyeshadow strip—are dulled with an acrylic lacquer con-

—with plastics

taining a flatting agent. By further adding pigments to the acrylic lacquer, the lid can be colored to simulate eyeshadow.

The completed eyelash weighs less than 7 milligrams. Over 4000 of them together would not weigh more than a single ounce. Application is by means of polyisobutylene-modified lanolin-based pressure-sensitive adhesive supplied with the eyelashes.

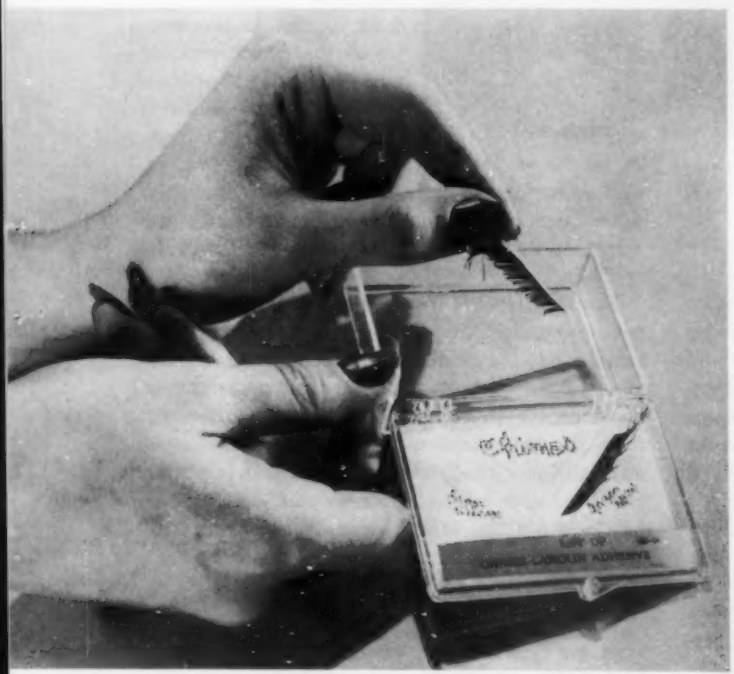
Packaging and merchandising

According to Campus Chimes, plastics were used extensively in packaging and merchandising the eyelashes to "provide the bold, educational approach which, it was believed, this product needed to overcome the natural reticence which women might feel towards an article of this type."

To lend an air of quality to the product, a molded clear styrene hinged box is used for packaging the eyelashes. An added decorative effect is achieved by making use of a platform insert vacuum formed of transparent cellulose acetate sheet. An over-all grid pattern formed into the acetate brightens the appearance of an identifying paper label that is slipped in under the transparent sheet. Also formed into the platform are two raised pedestals on which the eyelashes are mounted and a recessed well which contains the adhesive.

The 14- by 22-in. counter display used in merchandising the eyelashes is vacuum formed of 20-gage styrene sheet. The left-hand side of the display has a full-sized three-dimensional woman's face, flat white against a background of pink, with a pair of the eyelashes mounted in place. Thus, the prospective customer can see exactly what the eyelashes will look like when applied.

Credits: Engineering by S. Goodman; design by M. Bertrand; Mylar polyester film by Du Pont; Geon 121 vinyl by B. F. Goodrich Chemical Co.; acrylic lacquers based on Acryloid by Rohm & Haas Co.; Cab-O-Sil flatting agent for acrylic lacquers by Godfrey L. Cabot, Inc., Boston, Mass.; Vistanex polyisobutylene for adhesive by Enjay Co., Inc., New York, N. Y.; polystyrene box by Diamond Plastic Box, Inc., Roanoke, Va.



Molded styrene package has formed acetate platform on which the eyelashes are mounted

Counter display is vacuum formed of styrene sheet. Acrylic lacquer loaded with titanium dioxide is sprayed on 3-D woman's face to give plaster-like effect



Plastics' stake in TOYS

The toy industry, as represented on this month's cover by artist Clarence Carter, and the plastics industry have been bedfellows for a long, long time. The association has always proved to be mutually beneficial.

From the standpoint of volume sales, each year—at least since 1940—seems to bring a record high to the toy industry. Simultaneously, plastics' share of the market has shown an even more impressive rate of growth.

On the basis of 1957 activities and what is expected to show up at the March Toy Fair in New York, it appears that this progressive growth is going to continue. In 1957, retail toy sales hit a record $1½ billion mark. There are now over 50 million children under 15 years of age in this country and the birth rate in 1957 set another record of 4 million plus.



Exact figures on plastics' stake in this market are less definite, but manufacturers agree that it is anywhere from "considerable" to "tremendous." It is already taken for granted in the industry that plastics are now used in more toys than are all other types of material. And the future looks bright to all concerned.

Foreign competition

The competition which many American manufacturers are beginning to face from foreign imports (imports accounted for an estimated 5% of total sales in 1957) has encouraged them to turn to higher-priced plastics and to larger-size plastics toys which would be prohibitive in cost to ship from foreign ports. Another trend in favor of plastics is the swing in the public's buying habits toward better quality and higher-priced toys. As a result, manufacturers have been able to take advantage of some of the newer, tougher plastics and have thereby noticeably strengthened the reputation that plastics enjoy in the toy and game fields.

Dolls and doll accessories, the central theme of this month's cover, have been on the increase for some time and already account for close to 17% of total toy sales. Vinyl is practically a standard material for the manufacture of doll bodies, and it is estimated that almost 10 million lb. go into this application annually.

Vinyl inflatables are on the upswing and accounted for about 6½ million lb. of material in 1957.

The over-all consumption of styrene plastics by the toy industry was estimated at close to 42 million lb. in 1957. A good share of this material went into the do-it-yourself hobby kits.

The polyethylene figure for toys is shrouded in mystery, but it appears to be sizable. Many manufacturers are turning out large pieces. One trend that bodes well for polyethylene—as well as for styrene and other plastics—is consumer demand for realism. Toys such as the helicopters, trains, and boats, and the more advanced science toys, (satellite launchers, sky scanners, etc.) have to be large, complex, realistic in appearance, and colorful to sell. The snap-on features, which can be designed into plastics parts, are regarded as far superior to any other assembly techniques.

Even more exciting is the fact that all these predictions for future growth are based on materials that are currently available. It is impossible at the present time to accurately assess the increase in plastics usage that will result from the introduction of the newer polyethylenes and polypropylenes[1]—both materials that can be molded into boil-resistant, sterilizable products for the infant toy market; but there can be little doubt that it will be large.

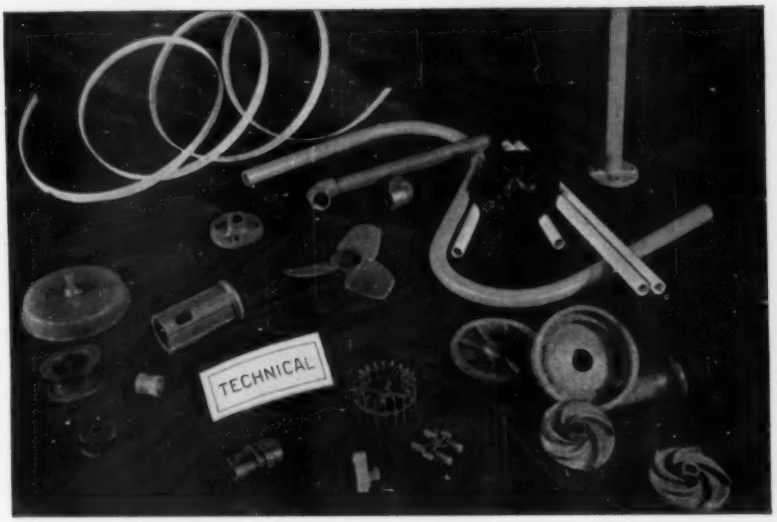
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[1] For additional information on these two materials, see "What's with polypropylene?" pp. 89-92 of this issue, and "The polyolefin plastics field—present technical status," pp. 125-133, also in this issue.



Toughness and wide range of colorability make polypropylene a strong contender for the housewares field. (Four-color plates, Montecatini)

What's with polypropylene?



Industrial applications include pipe, fittings, valves, impellers, textile machinery components, etc.

A whole new family of thermoplastics has been created by a new approach to the production of polymeric structures

By Dr. Mario Ottolenghi and Dr. C. Crespi†*

Two new terms have become a part of the language of plastics. They are "isotactic" and "stereospecific."

The first, from the Greek "isos" meaning "the same" and "tatto" meaning "regularly ordered," is the name given by Prof. Giulio Natta to one special group of the structures created by the use of his catalytic agents in the polymerization of olefins. "Isotactic" polymers are giant molecules of polyolefins with a high degree of crystallinity due to the exceptional regularity of their spacial structure.

The second term, "stereospecific," refers to the catalysts and their ability to direct polymerization in such a way as to predetermine the final configuration in space of the giant polymeric molecules. Stereospecific catalysts are used not only to make isotactic polyolefins but also other special molecular configurations like syndiotactic (another word coined by Natta),

*Chemore Corp.,
†Montecatini Soc. Gen.



Polypropylene, because it is sterilizable, is expected to find use in sanitary products in hospitals, institutions, and homes

special atactic structures and others. Very high yields of isotactic polymers were obtained for the first time with Natta's catalysts, and he was able to control the degree of isotacticity and, therefore, crystallinity and other properties of the desired end products within a wide range.

The first commercial results are the isotactic polypropylenes manufactured by Montecatini under the tradename Moplen.

These new plastics open a new era in structural chemistry since it is now possible to regulate the structure and molecular weight in such a way as to make polymers with tailor-made physical and chemical properties.

This wide range of properties in turn opens to polypropylenes a wide range of applications. Examples to date are pipes, fittings, valves, packaging, films, heat-sterilizable bottles, carboys, cable insulation, battery boxes, refrigerator parts, toys, radio cabinets, household articles—such as buckets, basins, and bassinets —spools and other parts for textile machinery, impellers and casings for centrifugal pumps, steering wheels for automobiles, and sheets for vacuum and pressure forming.

Polypropylene thermoplastics will probably compete with other polymers in many applications. They also promise to be useful in areas not now available to plastics for economic reasons or because desired properties could not heretofore be obtained.

Characteristics

Polypropylenes as made by Montecatini are colorless and odorless thermoplastic materials. They have physical properties directly attributable to their molecular structure and which fundamentally differ from those of previously known thermoplastics. These materials are exceptionally resistant to heat; they can be sterilized and used at temperatures in excess of 300° F. Their melting range is from 325 to 340° F., enabling them to outperform most other commonly used polymers in temperature resistance.

Mechanical properties are superior. Isotactic polypropylenes have higher tensile strengths and rigidity than high-density polyethylene; they have remarkably high compressive strength with compressive yield strength values ranging from 8500 to 9900 p.s.i. Their Rockwell hardness is between R-85 and R-95, and their impact strength is greater than 80 kg.-cm./cm.^{2} Since specific gravity is 0.90 to 0.91, isotactic polypropylenes are among the lightest plastics available. This means *more* product per *unit weight* of polypropylene used.

The new materials have an essentially nonpolar structure, so they exhibit excellent electrical properties even at high frequencies. Since they have practically no water absorption, the electrical properties remain virtually unaffected by humidity. Such excellent electrical properties combined with good thermal and mechanical characteristics result in superior insulation.

Their heat resistance and mechanical properties, together with unusual chemical resistance, make isotactic polypropylenes a good choice for pipe applications. They are resistant to acidic, alkaline, and saline solutions even at elevated temperatures. At room temperatures they resist organic solvents and polar substances without embrittlement. Absorption of mineral and vegetable oils is extremely low.

Films made from these polypropylenes are exceptionally impermeable to a wide variety of vapors and gases. And they are transparent.

Production methods

All of these properties would be of little use if the isotactic polypropylenes were difficult to process. Happily, technology and equipment for fabrication of polypropylene corresponds to that commonly used for processing other thermoplastic materials. Products made from Moplen exhibit fine detail, high finish, surface



Film made of polypropylene is clear, can be heat-sealed on conventional equipment used to seal polyethylene. (Photos, Montecatini)

Tub and pail made of polypropylene have glossy finish, high heat resistance, and warm feel. They are also light in weight



hardness, and excellent rigidity. Warm to the touch, they can be made available in any desired color.

Injection molding

The high fluidity of isotactic polypropylene permits relatively low molding pressures (10,000 to 17,000 p.s.i.) and the molding of thin-walled and complex shapes. Cylinder temperatures should be maintained between 392 and 500° F., depending on the form and weight of the molded piece. The temperature at the nozzle should be about 54° F. less than that in the cylinder.

Notwithstanding the fact that polypropylene's melting temperature is higher than polyethylene's, molding cycles can be very short, since the material's excellent dimensional stability permits the part to be extracted from the die at about 212° F. When dealing with large pieces, warpage can be avoided if the piece is left in the mold for a suitable length of time after injection to insure complete solidification. The amount of time required will, of course, vary with the part being molded. The mold should be run at about 176° F., and should have chromium plated surfaces to produce smooth and brilliant polypropylene end products. Linear shrinkage is about 3%—about the same as polyethylene—so that normal rules can be followed when establishing mold sizes.

Polypropylene does not require a plasticizer during processing. It is easily mixed by conventional techniques with pigments and/or dyestuffs to obtain a wide range of colors. Like polyethylene, the addition of carbon black or



Wire insulation of polypropylene has good electrical properties even under high temperature conditions, can be easily color coded

similar opacifying agents will impart permanent resistance to sunlight in the finished part. Polypropylene is not affected by diffuse light. Normal stabilizers give protection against oxidation during fabrication.

Extrusion

Tests conducted at different pressures reveal that the increase in extrusion rate with pressure is higher with polypropylene than with polyethylene. At normal working pressures, isotactic polypropylene flows faster than polyethylene of a similar grade.

Extrusion is carried out with conventional equipment employed for polyethylene, using a screw having a 4:1 compression ratio and a length equal to 18 to 20 times its diameter. As with polyethylene, care should be taken to obtain uniformity of temperature in the barrel and good performance of the cooling and drawdown systems. For pipes and miscellaneous shapes a barrel temperature of 347° F. and a nozzle temperature of 374 to 392° F. is suggested. Blown and tubular films require a barrel temperature of 356° F. and a nozzle temperature of 428° F. For flat-die films, a barrel temperature of 356° F. and a nozzle temperature of 428° F. should be used. When fast cooling is employed, the gloss and transparency of flat-die films are superior to those produced from polyethylene.

Polypropylene films may be heat-sealed with the same equipment used for welding polyethylene films and can be laminated to paper, cloth, or aluminum substrate with the help of rubber and steel rollers.

Covering wire with polypropylene is not difficult, but the product should be cooled uniformly and progressively immediately after extrusion. Wire covered with polypropylene exhibits excellent electrical and mechanical properties and high resistance to cracking.

Other processes

Polypropylene may be compression molded, fusion- and centrifugal-cast, metal-surface coated, drawn, and vacuum formed. Although compression molding is usually reserved for thermosetting compounds, polypropylene can be compression molded at 392 to 428° F. and at a pressure of 1400 to 1700 p.s.i. to obtain flat sheets, plates, or blocks which may later be machined.

Large-diameter polypropylene pipe can be produced by centrifugal and fusion casting, using polypropylene in powder form. The process involves a rotating tube heated to a temperature of 392 to 428° F.

In dip-coating metal surfaces, the object to be coated is heated to about 482° F. and dipped into powdered polypropylene. Fusion is completed in an oven at 482° F. to obtain a uniform, smooth coating.

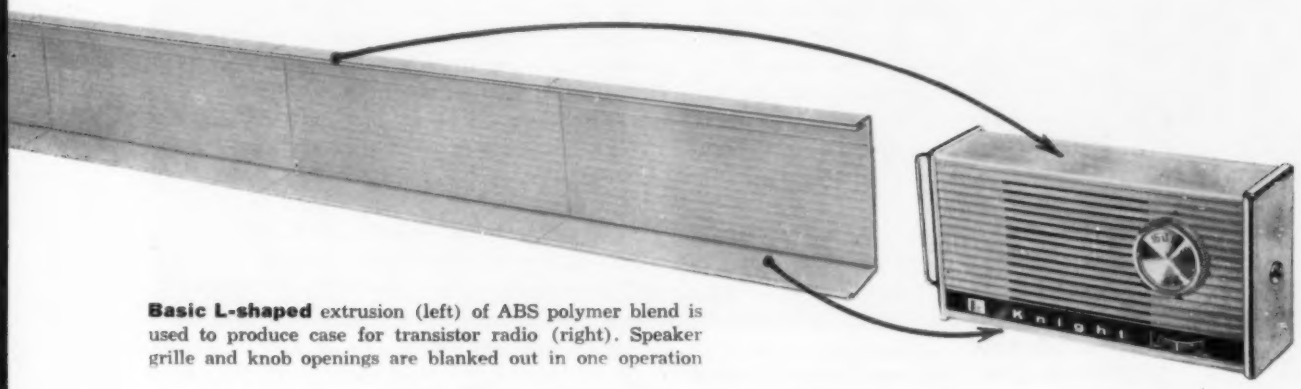
Large pieces and complex shapes can be produced by drape or vacuum forming polypropylene sheets and films. Normal machinery is quite suitable but the sheets should be blocked into the frame after they have already undergone partial thermal softening. Polypropylene films 8 to 12 mils thick possess sufficient rigidity to make boxes and other containers by drawing.

Polypropylene may also be welded, machined, and ink printed. In welding, a thin polypropylene rod is fused and the inert gas welding torch is set for a temperature of 392 to 428° F. Machining is accomplished with conventional tools and comparatively high cutting speeds can be applied. The adhesion of ink to polypropylene is good but can be improved by pretreating with methods commonly used for polyethylene.

A wide range of applications is open to the isotactic polypropylenes. They are versatile; they offer superior properties; they promise to be reasonably priced; their use will not require major changes in existing production equipment. Just what place these new materials will make for themselves in competition with other materials in today's markets remains to be seen. Certainly a great future is in sight for these and other such "tailored" plastics.

Extruded radio cabinet

New make-it-yourself kit has cabinet made from two pieces of one basic extrusion: another case history in our continuing series on the "Economics of extrusion"



Basic L-shaped extrusion (left) of ABS polymer blend is used to produce case for transistor radio (right). Speaker grille and knob openings are blanked out in one operation

Two mating extruded sections capped by stamped anodized aluminum ends make up the cabinet of the Knight-Kit five-transistor portable radio recently introduced by Allied Radio Corp., Chicago, Ill.

The extruded parts for this cabinet are produced from an ivory-colored ABS resin (Cycolac) by Custom Plastics, Inc., Melrose Park, Ill. Actually, there is just one basic extrusion. When one section is reversed, it mates with the next to form a rectangular case having a transverse cross section about $3\frac{13}{16}$ by 2 in.; length of cabinet is $7\frac{5}{16}$ inches. This part is extruded with a series of grooves which form the cabinet's exterior surface. It is run on a new $2\frac{1}{2}$-in. NRM extruder with conventional conveyor and take-away equipment.

Two identical parts are used to form the cabinet, except that one is left just as it comes from the extruder and the other is blanked out in one operation to produce the speaker grille, the opening for the station selector knob, and the slot for the on-off and volume control knob, which mounts horizontally. Other finishing operations include decorative silk screening and hot-stamping.

Use of extruded parts for this cabinet has proved particularly appropriate because of the fact that this is a kit-type radio, requiring a cabinet which can be put together easily. According to the extruder, the total tool cost on this job, including the extrusion die, the stamping die, and the fixtures used in the screening and hot-stamping operations, ran about $1500. Unofficial estimates on the cost of a two-cavity injection mold for a similar cabinet run from $5400 to $6300. Such a mold would involve intricate side coring, and hot-stamping and screening operations would still be necessary.

Assembly of radio housing from extruded sections is easy, a particularly desirable design feature for do-it-yourself radio kits



A new polyester film

Widely broadened bases for plastics film usage are in prospect as a result of the introduction of Goodyear's new Videne polyester film. At present two types are being readied for the market: Videne A, a laminating film for the protection and upgrading of various surfaces, and Videne TC, a heat-sealable shrinkable film for packaging applications. Eventually, there will be additional varieties, each for a different purpose. This article will discuss primarily Videne A.

According to Goodyear, the combination of properties that makes Videne A unlike any other film and that promises to make it a natural for the proposed fields of application includes the following:

1) Outdoor aging. Test panels (laminates of Videne A to various substrates) have now passed more than a year's exposure in Florida tests without crazing or yellowing. Materials such as polystyrene, which normally would fail in less than a year, are standing up well when protected with the film.

2) Adhesion. The film can be bonded to most surfaces by heat and pressure alone. Where an adhesive is required, as with impact polystyrene sheet, the film remains crystal clear.

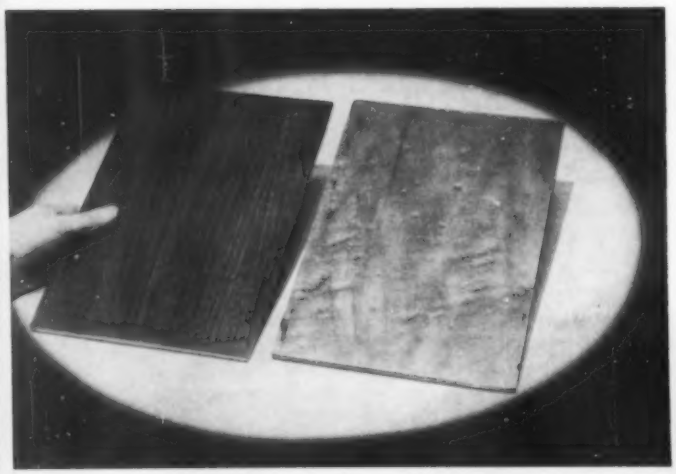
3) Abrasion. Tabor abrasion tests indicate that the film has at least twice the abrasion resistance of any known film surface, including melamine surfaces.

4) Processibility. Videne A can be vacuum formed, drawn, or embossed without incurring strain. The film is capable of 10-to-1 draw (e.g., from 3 to 0.3 mil), a characteristic important in stretch-laminating.

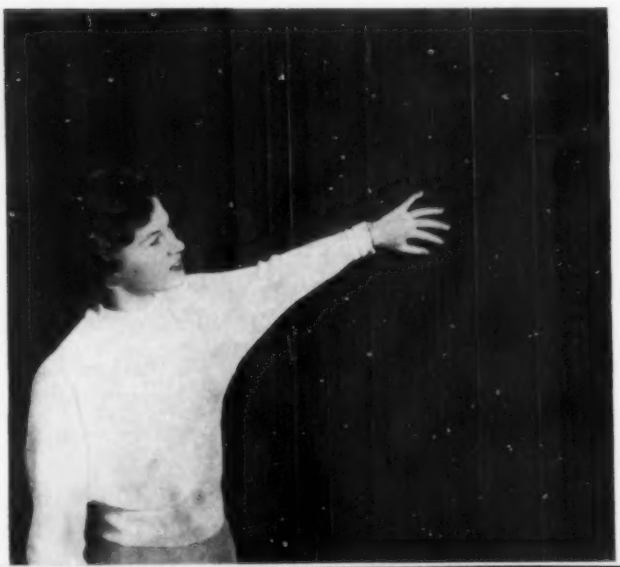
What makes it different?

One most important difference between Videne A and other types of polyester film is that Videne A is an amorphous, non-oriented material. Other types in use are crystalizable, crystalline, and oriented. Goodyear technicians claim that the amorphous structure imparts weatherability, adhesion, and formability that are not obtainable in an oriented, crystalline film unless the latter is specially treated.

Videne A does not have the tensile strength and elongation of oriented, crystalline polyester film; but then it is not intended for use as an unsupported material. It is primarily a



Plywood samples with polyester film acting as an adhesive to hold the plies together and providing a prefinished surface



Polystyrene planking with covering of printed Videne A. Note similarity of finish to wood-stained door and frame at left in photo



Samples of products with polyester film surfaces include printed decals, printed fabrics, vacuum formed polystyrene trays, paper laminations, and aluminum embossed panels

laminating film. (Future types will include oriented varieties.)

Videne A can be heat-sealed by conventional methods without a coating. Such seals are reported to have held up at sub-zero temperatures. The film has a wide operating temperature range. Between 170 to 180° F. it becomes tough and rubbery; at 250° F. it becomes adhesive; the best laminating temperatures are from just under 300 to 325° F.; temperatures for vacuum forming and embossing start at about 350° F.

Another interesting characteristic is the range of finishes. They may be either gloss (90 to 95 on Gardner 60°) or satin (40 ± 5 on Gardner 60°). After lamination, the satin finish is 30 to 35. Furthermore, unlike other polyester films and decorative laminate surfaces, a satin Videne finish can be controlled to cover a range of from 15 to 85, Gardner 60°. Both gloss and matte finishes are built-in and not produced by brushing or by an abrasion process.

Anodized aluminum laminated with Videne A film promises to be a good application. The



Three types of polyester film laminations to foil and paper, with sample packages that can be made from laminate. In this application, film surface is hidden from view in finished package because it normally is used as the inner liner. (Photos, The Goodyear Tire & Rubber Co.)



Tray vacuum formed of Videne A-polystyrene laminate is removed from machine. Pattern is printed on the polyester film. (See photos opposite)

film may be embossed and laminated to the aluminum in a continuous operation, using heated pressure rolls and no adhesive. The film gives a lustrous surface, resists scratching and weathering, and will not shrink away from the base. For non-anodized aluminum color can be provided either by spraying the aluminum and then laminating with a clear film, or by coloring the reverse side of the film before laminating. Use of such a material on automobile exteriors is a prospect. It has reportedly withstood 500 hr. of Weatherometer exposure.

Steel may be treated in the same fashion. Goodyear technicians claim that a Videne A thin film laminate is more versatile than a plastisol coating in that it gives better abrasion resistance and has no plasticizer to bleed out.

Plywood producers expect to derive many benefits from the new film. In fact, one producer has stated that "it gave promise of becoming the most helpful adjunct to come into the industry for years." In plywood operations, a 3-mil film is used for the outer surface. The surfacing film helps to bring out the depth of the grain, protects the surface, and eliminates a need for varnish or lacquer. Either a gloss or satin finish may be used.

It is also possible that Videne A may find application as the surface of a decorative laminate. Flexible PVC sheeting with non-fugitive plasticizers are a possibility, and either the vinyl sheet or the polyester film may be embossed. Rigid vinyls can be similarly surfaced to produce a decorative laminate.

Because of its good electrical properties, the film may also be used as a laminate on electrical grade papers for slot material and in capacitors. A ⅓-mil film has even been laminated to tissue paper for electrical uses. Difficult to handle typepapers, such as Quinterra, have also been successfully laminated. The film itself will withstand about 4000 v./mil.

Other uses for Videne A paper laminates involve decorative patterns where either the paper or film may be printed. A ½- to 2-mil film will produce a laminate that is oil-, water-, or grease-resistant. No solvent or adhesive is required in the laminating process and the finished product is heat-sealable. It is even possible to laminate a napped paper with this film.

Laminated to leather, the film would contribute mar and mildew resistance to luggage, belts, and handbags. Fabrics of various sorts could be laminated with a film on both sides for stain resistance and to bring out color on both sides. Chintz, draperies, etc. are possibilities. The reason why the film brings out or intensifies the color of a base material is not clearly understood, but it may be its extraordinary power of light refraction.

Glass fabric, too, can derive advantages from the application of a Videne A film. No adhesive is needed. And the resultant clarity is such that the complete laminate may be coated with an emulsion and used as a photo templet exhibiting excellent dimensional stability. The templet material could be shipped in rolls and save space and weight, compared with metal templets.

Another prospect is a Videne-butyrate sheet laminate in which a colored picture is reverse-printed on the Videne before lamination. The combined laminate is then vacuum formed for a 3-dimensional sign.

Impact polystyrene-Videne laminates are

Yield factor for Videne A

200 gage (0.002 in.) yields 7.76 sq. yd./lb.
300 gage (0.003 in.) yields 5.17 sq. yd./lb.
400 gage (0.004 in.) yields 3.88 sq. yd./lb.
500 gage (0.005 in.) yields 3.104 sq. yd./lb.
600 gage (0.006 in.) yields 2.57 sq. yd./lb.
700 gage (0.007 in.) yields 2.217 sq. yd./lb.

being developed as a wall covering and furniture topping. The combination consists of a gloss, satin, or printed Videne film laminated to polystyrene sheet. In this case, an adhesive is required, but it is contained in the ground coat ink on the reverse side of the film. The piece used for furniture is a deep-drawn vacuum formed job. The finished laminate has a good touch surface, will withstand outdoor aging and abrasion, and covers up any color imperfections on the surface of the polystyrene.

It should be noted that Videne A is compatible with nonplasticized vinyl ink, alkyd ink, or a Videne ink (made from resins provided by Goodyear), and is thus readily reverse-printed.

Videne can also be metallized easily. The satin grade metallizes with a soft metallic effect whereas the gloss grade exhibits the more brilliant metallic effect common to other films. Metallization can also be achieved by using a thin Videne A film laminate on foil. Videne A is suggested for decals and other applications that must withstand outdoor usage. It is also a possibility for auto trim laminates, both inside and outside. Its strong adhesive characteristics should be a safeguard against delamination.

Stretch lamination

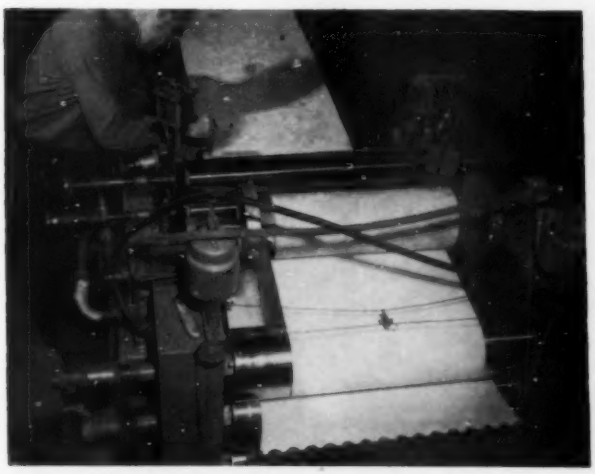
The use of Videne A as a stretch laminate is a particularly intriguing prospect since it can be a potent factor in reducing cost. In Goodyear laboratory tests, it has been stretch laminated over paper at a rate of 250 ft. a minute. Strangely enough, the film can be oriented on a stretch laminator at a film temperature of from 180 to 220° F.; but above 240 to 250° F., the film is only thinned out with no orientation effect. A 3-mil film can be thinned down to a ⅓-mil film on a stretch laminator without losing appreciable width and it adhered to the base without an adhesive. A typical operation would be to laminate a 1-mil kraft paper with a ⅓-mil thickness of film. Thus a customer can buy a thick film and reduce it down to the thinness he desires and laminate it over foil, paper, fabric, and perhaps other plastics.

One of the possibilities hoped for is a laminated paperboard milk carton that can be as low-cost as polyethylene-coated containers. Since the material is heat-sealable, the carton could be easily fabricated, there would be no pinholes, it would be greaseproof without waxing, and the end cost might be less than wax-coated boxes. The lamination can also be flame sterilized because of the high melting point of Videne.

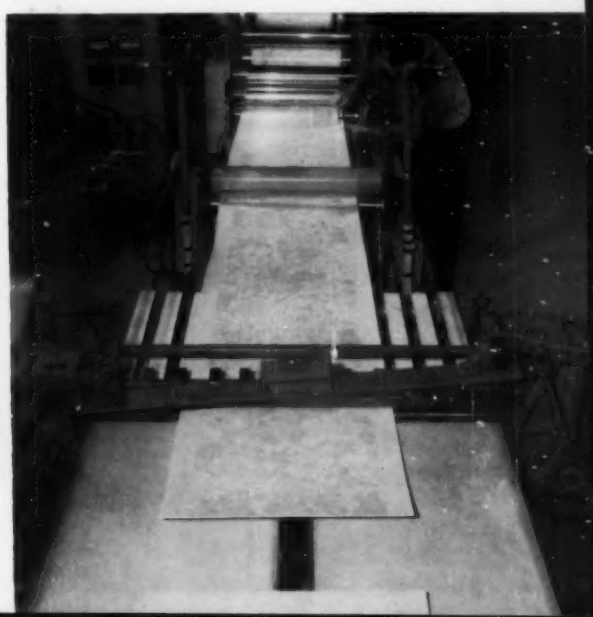
The same operation might be used for cake, cookie, and doughnut boxes—possibly even cereal boxes wherein the food would be packed directly in the coated paper box and the need for glassine eliminated. These cartons could be completely heat-sealed, eliminating costly gluing operations.

Another possibility is a laminated bag with a grease- and moisture-proof interior that could be sealed along the side and bottom. Paperboard for containers could be (*To page* 216)

Printed polyester film with heat-sensitive adhesive on back is laminated to a continuous roll of polystyrene sheet material



Finished polystyrene-polyester film laminate is cut to size required for subsequent vacuum forming operation. Operator checks gage



The Loadbuster

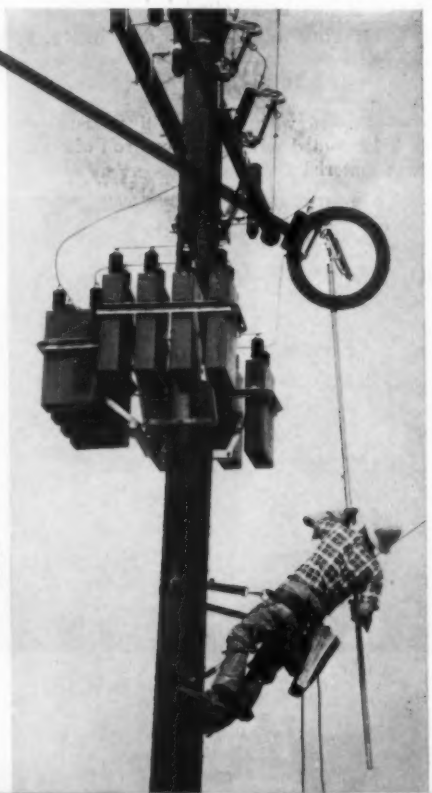
Portable tool for interrupting high-voltage electrical distribution circuits incorporates a number of different plastics parts

At least 10 functional components of the Loadbuster, an ingenious new portable circuit-interrupting tool for use on high-voltage power distribution lines, are molded or fabricated of plastics—phenolic laminate, polyethylene, acrylic, ABS (acrylonitrile-butadiene-styrene), and polyester-glass. Thanks largely to these plastics parts, selected for their specific properties, the tool is rugged, safe, light in weight, convenient to use, and built for long service.

Developed and manufactured by S & C Electric Co., Chicago, Ill., the Loadbuster marks an entirely new concept in circuit switching. Easily carried on electric company service trucks, the tool brings positive, safe switching within the reach of any utility's pocketbook. Because



Cutaway view of circuit-interrupting device. Components are shown on opposite page



Loadbuster (circle), mounted on universal pole, being hooked to upper contact of cutout

it is portable, it eliminates the cost of building costly load interrupting features into disconnects and cutouts.

The Loadbuster was introduced to meet a serious problem in power distribution. In recent years, rapid load growth has raised primary distribution voltages. Today, 12- to 14-kv. primaries are used in many areas. While conventional disconnects and cutouts can interrupt lower voltages with safety, the unconfined arcs accompanying such switching at 12-kv. and above can lead to possible personnel injury and equipment damage.

The Loadbuster is engineered to operate at any voltage through 14,400, and to break all load currents through 400 amperes. In use it is attached to a pole 6 ft. or more in length. To break a load, the tool is hooked across the upper contact of a disconnect, which is then opened by pulling down on the pole. No arcing, link breakage, contact burning, or danger to the operator are involved.

The Loadbuster is 16 in. long and weighs 3¾ pounds. Basically, it consists of an outer sleeve of NEMA Grade XX phenolic laminate tubing mounted to a cast aluminum alloy chassis and hinged frame. Within the tubular housing is a slidable internal tube of NEMA Grade CE phenolic laminate stock, which encloses the contact assemblies and other working parts.

Component parts

Accompanying photos show the compounds of the device. The bail at the upper end cap is the electrical connection to the upper contact of the cutout. The lower prong engages the pull ring electrically and mechanically. As the cutout is pulled open, the current is diverted through the interrupting unit of the tool. Continued pulling extends the internal spring, which is released automatically at a predetermined point in the opening stroke, separating the contacts. Actual interruption of the current load is performed through the use of a moving contact, a stationary contact, an arc-extinguishing bore or liner, and a trailer which fits inside it. Both the latter parts are made of acrylic material. In final position, the spring has drawn the moving contact and trailer upward, establishing an isolating gap within the arc-extinguishing bore where the circuit has been interrupted.

The largest plastics components of the Loadbuster are the inner and outer tubes fabricated from phenolic laminate. The polyethylene components, produced in a three-cavity family injection mold, include the hood, which insulates exposed metal parts that may be hidden from view of the lineman using the tool; the bumper, a ring-shaped part which cushions contact between the contact tube and the trigger assembly; and a small tube whose function is to absorb shock on the trailer and shield the trailer hitch from the arc.

Polyethylene was specified for these components because of its high dielectric strength, its constant resilience over a wide temperature range, especially at lower temperatures, and its good resistance to surface contamination, permitting it to be easily wiped (*To page* 196)

Major plastics components of Loadbuster. At top is interior housing made of Grade CE laminate; below is exterior housing of XX laminate. Polyethylene parts (lower left) include hood, bumper, and small tube used in internal assembly. Resetting latch (center) is one of four parts injection molded of ABS material. Three acrylic parts at right are liner and trailer—which quench arc through release of deionizing gases—and window, externally threaded to screw to lower end of tool. Enclosed in trailer is "hitch" fabricated from polyester-glass rod stock



How and why to use

Glass-reinforced injection



Top of portable-phonograph, injection molded of glass-reinforced polystyrene, can be produced with either a high-gloss or satin finish, passes Underwriters' test for this application. (Photos, Fiberfil Corp.)

Engineers and designers in the plastics industry, which is constantly increasing its range of materials, are becoming familiar with the abbreviation "GFF" (glass-fiber-filled) as it applies to injection molding compounds. You will be hearing more about these materials and you'll be using them.

They are, briefly if somewhat technically, thermoplastic molding materials containing colloidally dispersed glass fibers having a preselected degree of glass bundle dispersability built into each pellet and having chemically reactive bonding agents selected to provide the proper degree of bond between the glass fiber and the particular resin involved. These compounds are from 1/3 to 1/4 fibrous glass. In appearance, they are generally 1/4 in. to 1/2 in. long cylindrical pellets about 1/8 in. in diameter. They feed and mold well in any up-to-date injection machine to produce rigid articles without trim or unreusable waste and having outstanding physical properties, dimensional stability, and general ruggedness.

*Vice-President and Research Director, Fiberfil Corp., Warsaw, Ind.

How they are made

The GFF thermoplastic compounds are *not* made by mixing chopped glass and resin granules; nor are they made by adding chopped glass to granules in the machine hopper. Both these methods were tried; both failed.

Today they are made by three basic methods, which produce somewhat differing results even with the same resins.

In Type A compounds, fibrous glass is saturated by some extended form of the plastic material. Examples are: 1) solvent solutions; 2) emulsions; and 3) aerosols, foams, etc.

In Type B compounds, the fibrous glass is

*By Rexford Bradt**

molding compounds

saturated with molten resins. This process is commercially adaptable to only those plastics which become thin liquids when melted.

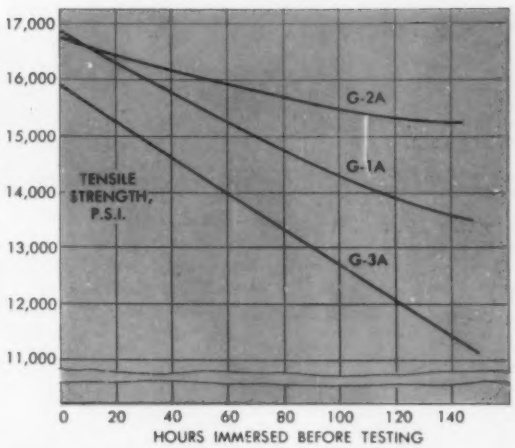
In Type C compounds, the glass is saturated with monomers, prepolymers, or mixtures containing same which are advanced or cured *after* saturation.

Among the technical problems in the production of these materials are the bonding of the resins to the glass and the requirement that each and every glass monofilament must be completely coated with both the bonding or coupling agent and the thermoplastic resin itself. Otherwise, true dispersions are not obtained.

In general, as glass fiber length increases from ⅛ in. to 1 in., the following happens (when molded in a 4-oz. molding machine): all tests become increasingly erratic at glass lengths of ⅝ in. and up, due to non-homogeneity and erratic machine feeding of the resultant coarse product; tensile tests go up slightly, if at all; heat distortion stays about constant; hardness and elongation usually drop a little, while the impact strength goes up materially.

For the above reasons, ⅜- to ½-in. long fibers have become standard for nylon and styrene respectively. The nylon fiber length has been supplied shorter in standard grades because nylon frequently is molded on smaller equipment. The shorter pellets feed better in such equipment.

Special short fibered (¼-in.) pellets have



Several materials for water-meter parts were strength tested after being immersed in water for various lengths of time. Glass-filled nylon G-2A had strength of 15,200 p.s.i. after 150 hr., probably will have over 13,000 p.s.i. after many years in water. (Data, Fiberfil)



Cut-away view of anti-tank mine that cannot be detected by magnetic devices. Mine housing, molded of reinforced polystyrene, will withstand arctic cold and desert heat. Close-tolerance molding assures perfect fit of 24 internal components. (Photo, Owens-Corning)



Cancer diagnosis is speeded by Autotechnicon tissue processor, in which containers molded of glass-reinforced nylon (arrows) resist shrinking, swelling, and warping when subjected to alcohol, chloroform, and other reagents. (Photo, Owens-Corning)

been made for use for miniature parts manufacturing. Seldom do these parts require high impact, so the shorter fiber is believed to be adequate.

It is conceivable that the very long fibered materials (1 in. or longer) will find application in extremely large injection molding equipment of the future.

Glass dispersion

Another technical problem is that of glass dispersion in the resin. If a properly treated glass material is given a thin coating of high melt index resin—or a resin approaching thermosetting properties—before saturating with normal molding viscosity resin, the bundles will not disperse easily, if at all. This type of formulation can be used in an open gated system to produce rough and rugged parts with particularly high impact strength.

Conversely, pre-coating with softer (lower-viscosity-when-molten) materials makes for easy dispersing grades, giving high-finish parts in which the glass is scarcely visible or may not be seen at all.

Dispersion of the glass is obtained by proper formulation *and* proper molding techniques. An injection molding machine can be an efficient homogenizer when used with fine-gated molds and/or dispersing nozzles. Shear speeds of 60 m.p.h. are commonplace, even with gates of 0.040 to 0.050 in. square. Pinpoint gates may produce even higher shear speeds. Since such shear is non-turbulent and entirely linear, very little breaking of the glass fibers actually occurs.

Unique properties

At first glance, the term "mold shrinkage" looks like something of interest only to mold designers. When this term is changed to "controlled mold shrinkage" it doesn't appear any more interesting. However, when it is said that glass-filled materials having "controlled mold shrinkage" essentially reproduce the mold size, the subject gets somewhat more interesting. But when the statement is made that "you can mold controlled mold shrinkage in glass-nylon, glass-filled styrene, glass-filled styrene-acrylonitrile, glass-filled polyethylene in the same mold and obtain interchangeable parts," it begins to mean money in the bank.

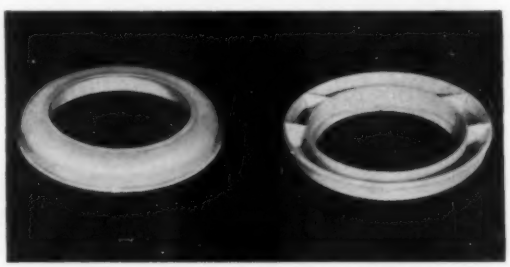
Once mold shrinkage is controlled and thermal expansion properties adjusted to approximately equal those of steel so that a piece molded in a hot mold will shrink the same as the mold, it follows that a properly molded piece will fit.

The injection molder can now mold rigid, stable, precision finished parts in semi-automatic machines which can be bulk fed from bags, barrels, or stock silo bins. Less heat, labor, and waste are involved than with most other processing methods.

Superior properties

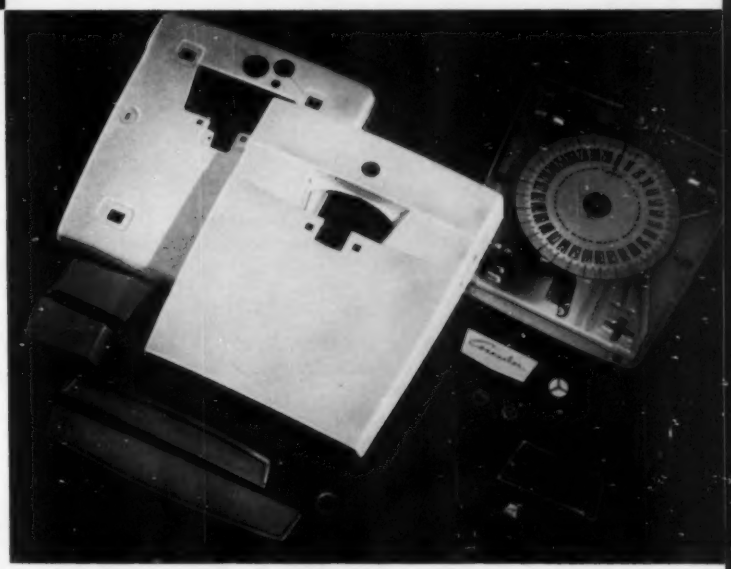
GFF injection compounds can be considered as greatly upgraded materials. The glass-reinforced styrenes, nylons, and polyethylenes may be compared to their equivalent unfilled grades as follows: tensile strength—100 to 150% gain; impact strength—much over 100% gain; elongation—virtually (*To page* 192)

Grease-retaining rings injection molded of glass-reinforced polystyrene. Currently, one such ring is being used on each wheel of all G-M diesel trucks. (Photo, Fiberfil Corp.)





Bath scale acquires trim, modern look with injection molded platform. Holes cored into part permit attachment of other components



Components of scale. Molded platform is at center, sheet steel stamping to which it will be cemented is at its left

Molded bath scale platform

Integral color, modern design, and immunity to corrosion are some of the advantages gained by The Brearley Co., Rockford, Ill., in specifying injection molded ABS (acrylonitrile-butadiene-styrene) for the exterior housing of its new Counselor Classic scale. The unit, which retails at $20, was designed by Palma-Knapp Associates, River Forest, Ill.

The housing, 11 in. long, 10½ in. wide, and 1¾ in. deep, weighs about 10 ounces. Wall thickness varies from 3/32 in. near the center to about 1/16 in. near the edges. Functionally, the housing serves as an exterior decorative shell for an underlying sheet steel stamping which actually transmits weight to the weighing mechanism. In the manufacturing process, the plastic cover is permanently cemented to this metal component. The part, dimensionally stable, durable, and highly resistant to abrasion, is produced on a 22-oz. injection machine, using a single-cavity, side-cored mold.

There are 12 openings and slots cored through the top of this part, including the large opening for the glass magnifying dial lens, and four slots in each end, which provide a means of anchoring gold anodized aluminum trim strips to the cover; two such strips are used across the top of the scale.

To accommodate the trim strips and bring them flush with the top of the platform in the finished scale, the housing is designed with conforming recesses. Another recess locates a metal decal carrying the letter C, which is mounted on the top of the housing just below the Counselor name plate.

The name plate, also molded of ABS material, has two split tapered studs on the back which snap into the cover and eliminate the need for supplementary fastenings. The name, molded directly into the part, is wiped-in for increased legibility. Four name plates and four zero adjustment knobs for the dial are produced simultaneously in an eight-cavity family mold. The adjustment knob, having a cored boss on the underside, mounts on the top of the scale in a die-cast metal cup which provides a protective bezel around it.

Credits: Plastic parts for scale molded of Marbon's Cycolac material by Globe Imperial Corp., Rockford, Ill.



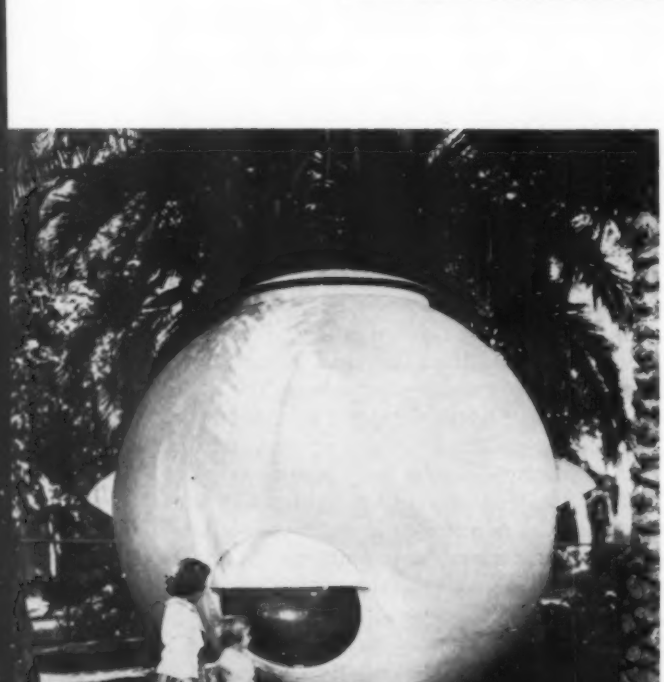
Home accessories

Four free-form bowls and a selection of handsome and useful trays are among the highly decorative new plastics accessories to grace the modern household. These reinforced plastics products, molded of polyester resin and fibrous glass in matched-metal dies, are fadeproof, shatterproof, and impervious to spilled foods and liquids. The bowls, which may be used as snack servers, planters, salad bowls, or you-name-it, are manufactured in a range of 15 colors.

The new line of reinforced plastics trays has striking patterns of leaves and ferns with subtle beige, smoke, and green hues; one translucent model is decorated with butterflies. Designed for use indoors or out, the trays, offered in 12 different patterns, combine functional value with esthetic appeal.

Credits: Bowls and trays manufactured by Kimball Manufacturing Corp., Harbor at Mill St., San Rafael, Calif.

PLASTICS



Reinforced plastics

A delightful and practical "fish bowl" design for a huge outdoor exhibit tank is the result of imaginative use of plastics materials. The tank, which now charms and amuses hundreds of children every day at the San Diego Zoo, holds 3000 gal. of water and houses about 250 tropical fish. The globe-shaped unit also contains all the necessary pumping, heating, and filtering devices needed to keep the fish healthy.

The circular tank was built of polyester resin reinforced with fibrous glass. It was fabricated in two hemispheres contact-molded separately in female molds. After curing, the hemispheres were joined by the addition of layers of fibrous glass and resin to form the two halves into a sphere.

After the completed fish bowl was cured, four circular portholes, 36 in. in diameter, were cut. Into these circular openings were fitted four blisters formed from clear acrylic sheet to make windows through which the tropical fish can be



Vaporizer—humidifier

Cold sufferers who find relief through the use of a vaporizer can now have a new model which will brighten the household as well as provide respiratory relief. The unit, molded of bright turquoise intermediate-density polyethylene, has an ivory-colored cap. With these attractive colors, the new vaporizer has none of the "sick room" characteristics usually associated with these devices. The product is completely portable, since it weighs only 4½ lb., even though it has a full 1½-gal. capacity. The vaporizer, which can also be used as a room humidifier and as such can be invaluable for keeping house plants healthy, shuts itself off automatically when all the water is vaporized. The polyethylene material of which the vaporizer is molded is heat-resistant, unbreakable, and easily kept clean.

Credits: Molded by Richardson Co., Melrose Park, Ill., for Hankscraft Co., Reedsburg, Wis.; Hi-D polyethylene from Spencer Chemical Co.

PRODUCTS

"fish bowl"

viewed. The transparent blisters, similar to those used in aircraft canopies, were made by the free-forming technique. After final assembly and sealing of seams around the portholes, the fish bowl was mounted on a concrete base.

The unit closely resembles the common glass fish bowl, and brings great delight to the youngsters who visit the Zoo. In addition, it is an entirely practical exhibit tank, since the materials of which it is made are impervious to water and resistant to weathering. The color is an integral part of the reinforced-plastics material. Also, the inner surface of the tank is smooth, which is important from the standpoint of protection for the fish, which would injure themselves in rubbing against a rough surface.

Credits: Designed by Visual & Industrial Design, 3603 Fifth Ave., San Diego 3, Calif., and fabricated by Livesay Manufacturing Co., Santee, Calif. Polyester resins supplied by Reichhold Chemical Co.



What they're **both** saying about new Lustrex* Hi-Test 88B

Both extruders and formers have found Lustrex Hi-Test 88B extrusion-grade is an extremely versatile high impact styrene compound. It answers the extruder's need for a material that can produce sheet particularly qualified for vacuum forming high-grade lighting fixtures, packaging, toys or industrial applications requiring high-impact strength. For complete technical information, write Monsanto Chemical Company, Plastics Division, Room 221, Springfield 2, Mass.

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vacuum formers:

"Excellent Flow . . .
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" 'whiter' whites . . ."

"We like the fast rate at which Lustrex Hi-Test 88B can extrude sheet on standard machines."





"The sheet has a smooth finish . . ."
"free from streaks, fish-eyes . . ."
"more re-usable scrap . . ."

"Complex shapes with no loss of strength . . ."
"Deep draw molding with no sacrifice of wall thickness or toughness . . ." "Sharp detail . . ."



"Excellent flow. Sheet fills out mold very uniformly."
"Minimum blow-outs in deep drawing."

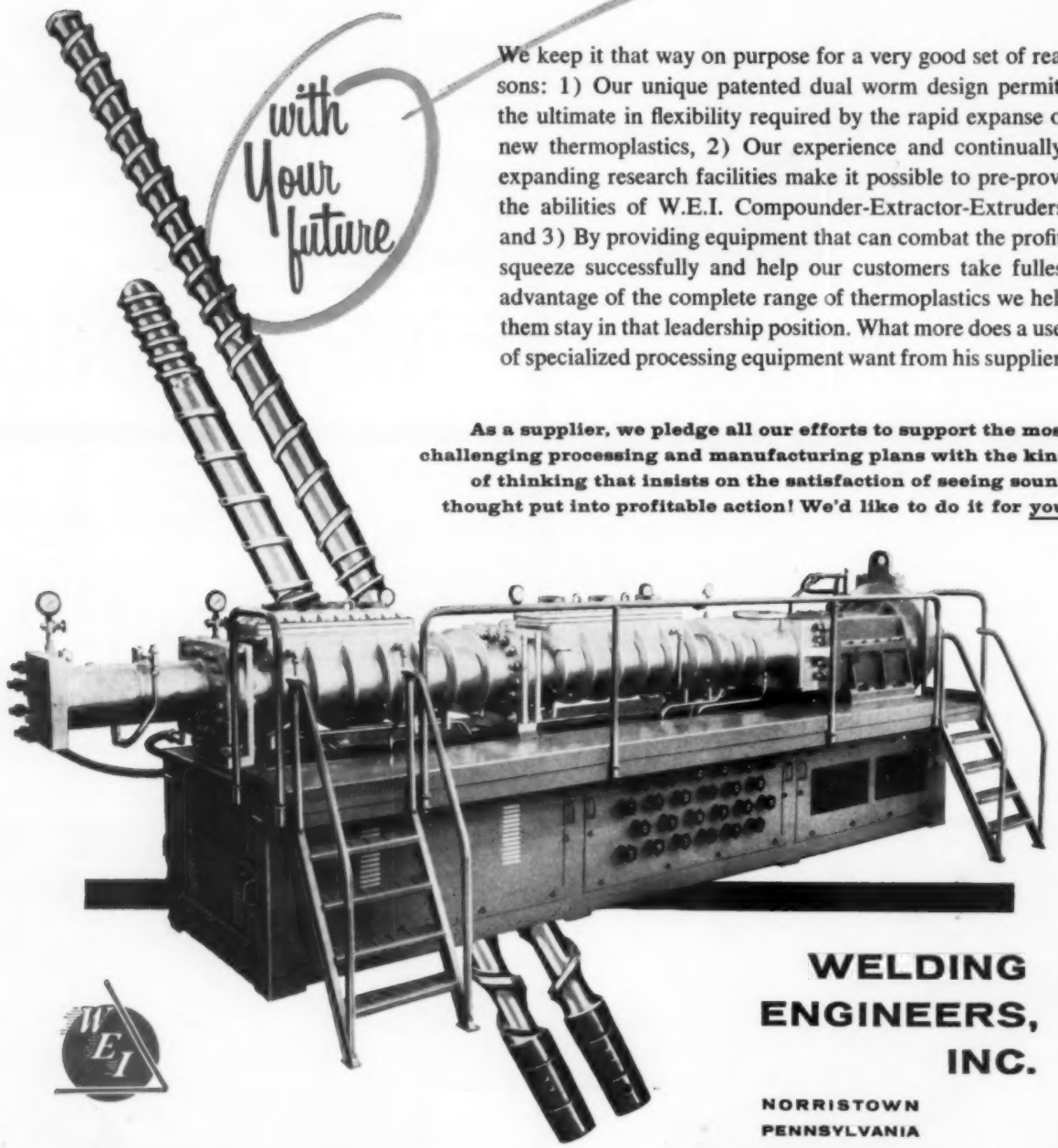
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Plastics Engineering

Dr. James F. Carley, Engineering Editor

Electronic heat-sealing

The theory underlying dielectric heating is reviewed with particular reference to sealing; factors important to machine design and use are discussed in the light of this theory

By Robert D. Farkas†

Dielectric heat-sealing of plastics is perhaps the most well known application of dielectric heating. Its popularity has increased sharply since World War II. Typical items produced on electronic heat-sealing machines are inflatable toys, wallets, ladies' handbags, swimming pools, shower curtains, folding doors, rainwear, gloves, wall coverings, automobile door panels, automobile seat covers, and quilting used in garment bags, upholstery, hassocks, baby carriages, belts, etc.

In these applications dielectric heat-sealing replaces sewing. Its greatest advantage lies in the ability to reproduce a welded pattern exactly from a die and to remove the waste material in an efficient fashion. Complicated assembly procedures can be performed by unskilled operators, using simple jigs and fixtures with resulting uniformity of finished products in a comparatively short production time.

Capital outlay for heat-sealing equipment is high compared to that required for sewing machines; each product requires a special set of sealing dies. But this cost is easily offset by the saving in labor. It is quite possible, for example, to produce a complete raincoat in approximately 38 sec. of sealing and tearing time.

Another advantage of dielectric heat-sealing is that the waste can be torn from the finished article, leaving a clean edge. This waste is frequently sold to mills for use in the production of reprocessed film. In most cases the finished article requires no pressing or ironing or any other procedure outside of packaging after the final seal.

To date, the most popular material used in heat-sealing is unsupported, plasticized polyvinyl chloride (PVC) in thicknesses ranging from 2 to 50 mils and more. The most common formulation is flexible with fair cold-crack characteristics and in all colors, with finishes which are embossed or printed or both.

Lately, other materials than PVC sheeting have been dielectrically heat-sealed with great

*Reg. U.S. Pat. Off.

†Chief Engineer, Guild Electronics Inc., 388 Broadway, New York 13, N.Y.

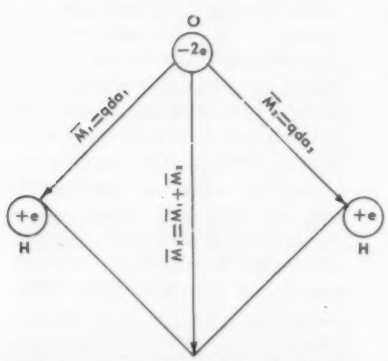
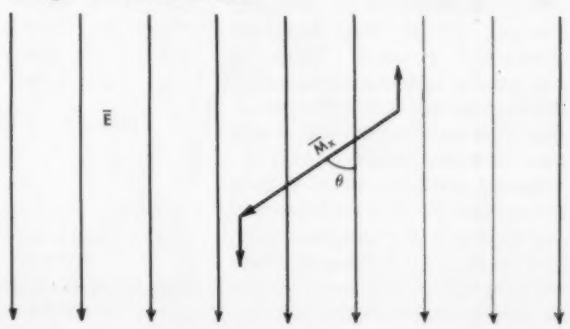


Fig. 1: Diagram of charge distribution in water molecule, showing contribution of each arm to total moment

Fig. 2: Interaction of electrical field and local charge distribution of polar molecule causes torque that tries to align molecule with field



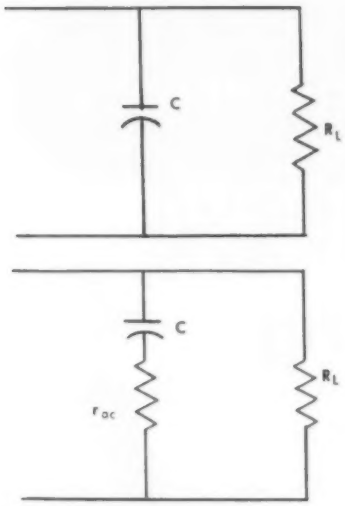


Fig. 3: Any practical capacitor has large leakage resistance R_L acting in parallel with capacitance. In d.-c. circuit (top), a tiny current passes through R_L when an e.m.f. is maintained across terminals. In a.-c. circuit (bottom), alternating voltage causes a much larger in-phase component corresponding to r_{ac}

success. These include Mylar film, vinyl and polyurethane foams, nylon, Kel-F, saran sheeting, and vinyl-clad metals.

Dipole moment does it

Dielectric heating is successful only in materials that are at least moderately polar in nature. Polar molecules are characterized by one or more ionic valence bonds, in which electrons are "borrowed" from one atom to help fill the outer electron shell of another. Since the original atoms are electrically neutral, the formation of such a bond causes a dislocation of electric charge, the donor atom becoming positively charged, the borrower becoming negatively charged. Pairs of charges of opposite sign, called dipoles, are set up. If a dipole is placed in an electric field, it will attempt to line itself up with the potential gradient, since if it is not so lined up, the interaction of the field and the charge centers sets up an aligning torque, called a dipole moment. Since there are no dipoles in coordinately bonded materials like paraffin and polyethylene, the molecules of these materials are not disturbed by local changes in electric potential. Also, certain symmetrical molecules, even though they contain dipoles, are little affected by electric fields because the dipole moments are equal and opposing. This is why TFE resin, which contains polar C-F bonds, is not dielectrically heatable.[1]

A simple water molecule (Fig. 1, p. 109) will clarify this point, upon which this whole branch of plastics processing depends. Each hydrogen (H) atom carries a 1-unit positive charge, since its electron has been borrowed by the oxygen (O), which in turn carries a double-negative charge (and here's one double-negative that definitely does not make a positive). The three atoms together have zero net charge, so the water molecule as a whole is chargeless. However, if this molecule is placed cross-wise in an electric field of unit strength, each H-O dipole will be subjected to a moment given by

$$\overline{M} = q\,(da) \qquad \text{Eq. 1}$$

The vector sum of the two moments is

$$\overline{M}_s = \overline{M}_1 + \overline{M}_2 \qquad \text{Eq. 2}$$

This torque will tend to align the molecule in the direction of the field at that point. Suppose now that this dipole is dropped into a field of strength $\bar{E}$ in such a way that the equivalent moment arm makes an angle θ with the potential gradient (Fig. 2, p. 109). The torque generated is equal to the vector product of the dipole moment and the field strength, and is expressed as

$$\overline{T} = M_s \mid \overline{E} \mid \sin\theta \qquad \text{Eq. 3}$$

[1]See Von Hippel, A. R., "Dielectrics and Waves." 1954. New York: John Wiley & Sons, Inc.

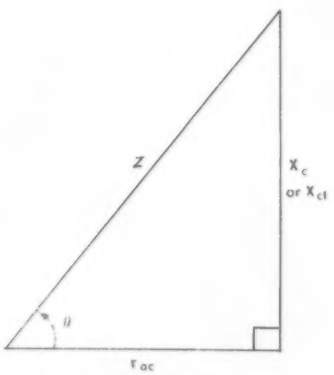


Fig. 4: Phase relationship in a.-c. capacitive circuit

Alternating voltage causes heating

So far only a simple constant electric field has been considered in which, once the dipoles are aligned, they will of course stay that way. But if the field direction is reversed at relatively high frequency, the dipoles will attempt to realign with each change of field direction. The greater the viscosity of the medium, the greater will be the resistance to the realignment and the more work will be done in accomplishing it. This work is called dielectric loss, and, since it appears in the material as heat, is the cause of dielectric heating effects.

If the d.-c. field is induced into a single isotropic[2] medium located between two parallel conducting plates, a capacitor (or condenser) capable of storing charge will be constructed. The dielectric constant of the medium determines the charge-holding capacity of the condenser; this is usually expressed as the ratio of its capacity to that of another in which the dielectric is simply a vacuum. The dielectric constant of any practical dielectric e_r is greater than unity.

Of course, no dielectric is a perfect insulator, and even in the best there is some small leakage current which would eventually discharge the constant-field capacitor if it were disconnected from the charging voltage source. Since the leakage resistance R_L is high, very high voltages would be needed to cause any significant leakage current. If too high a voltage is impressed, the dielectric material will break down chemically, providing a conductive "tube" for the current, which may then become large. The breakdown voltage is an important characteristic of the medium to be heat-sealed.

[2]For the purpose of this article, an isotropic medium is one in which the dielectric constant is the same in all directions.

An equivalent electrical circuit for this d.-c. capacitor is given in Fig. 3, p. 110; the C in top circuit represents capacity of the condenser in farads and R_L is the leakage resistance in ohms.

When the same capacitor is subjected to an alternating (a.-c.) voltage (bottom diagram in Fig. 3), the continuous change in polarity of the charges results in a current being passed through the medium. The ratio of the impressed a.-c. voltage to the component of current in phase with the impressed voltage is the a.-c. resistance r_{ac} of the capacitor. Since this is usually very much smaller than R_L, the leakage current may be neglected hereafter.

The capacity of a parallel-plate condenser is given by the following equation

$$C = 0.224\ e_r\ A/d \qquad \text{Eq. 4}$$

where A = the common plate area in sq. in.; d = the plate separation in in.; e_r = the relative dielectric constant (no units); C = the capacity in micromicrofarads ($\mu\mu f$).

Every capacitor has a power factor (PF) which is a measure of the "lossiness" or dielectric heatability of the dielectric. Power factors at 1 mc. range from 0.0003 for TFE resin to about 0.07 for plasticized PVC compounds and even higher for some phenolics.[3] The power factor is equal to the cosine of the phase angle θ of the capacitive circuit, the angle by which the current leads the voltage. The capacitive reactance X_c and the a.-c. resistance r_{ac} are related to the impedance Z of the capacitor in a right-triangle fashion, as graphically shown in Fig. 4, p. 110.

For convenience in handling circuit calculations, the capacitive reactance X_c is looked upon as the imaginary component of the impedance and is defined by the equation

$$X_c = -j/2\pi f C \qquad \text{Eq. 5}$$

where f is the frequency of the impressed voltage in cycles/sec., C is the capacity in farads, and j is $\sqrt{-1}$, which is in this case used as a mathematical operator. From Fig. 4 it is clear that as if X_c is held constant, higher values of r_{ac} will give higher power factors. Conversely, if r_{ac} is held constant, reducing X_c also increases the PF, X_c drops with increasing frequency. (Molecular resonance may upset this generalization.) Thus, the higher the frequency, the more heat is developed at a given voltage, etc.

The power expended in the circuit is given by the following equation

$$P = E^2 \cos\theta/\sqrt{r^2_{ac} + X^2_{ct}} \qquad \text{Eq. 6}$$

where P is the heating rate in watts, E is the root-mean square of the applied voltage, and X_{ct} is the total capacitive reactance in ohms of the capacitor at the operating frequency. X_{ct} has two parts—a working part and a wasted part—which will be discussed below. The denominator of this expression, of course, is equal to Z. Since Z is roughly proportional to the inverse of the frequency and capacity, and since (from Eq. 4) C is proportional to e_r, it is apparent that the heating rate increases with 1) the square of the applied voltage, 2) directly with the power factor, and 3) approximately directly with the frequency and dielectric constant.

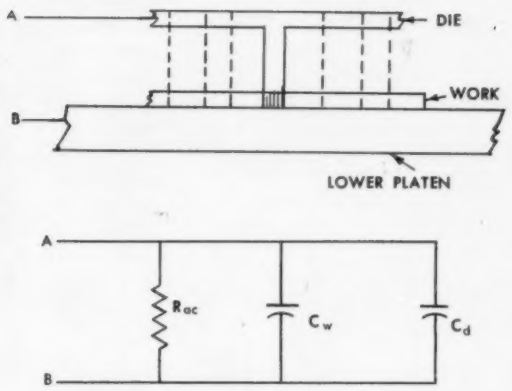


Fig. 5: At top is a sketch of a typical h.-f. heat-sealing die, showing working and stray capacity components. Below is corresponding electrical schematic diagram

Stray capacity is wasteful

In most practical equipment it is not possible to concentrate the entire capacity of the condenser in the area where a seal is to be made. Undesirable distribution of waste capacity is a deterrent in all heating applications since the stray capacity is usually lossless and therefore increases X_c without increasing r_{ac}, with resultant reduction in power factor. Consider the top part of the diagram of Fig. 5, above, which shows a sealing die with a T-shaped section in working position. Here the only useful electric field is represented by the solid lines at the lower tip of the T.

The dotted lines represent a weaker electric field acting on areas where it is not wanted. Although this field is weaker and much of the intervening space is filled with low-dielectric air, still the area is large and the distributed capacity is appreciable. These extraneous lines of force can be very troublesome in some applications. Figure 5, lower part, is the schematic equivalent of the top portion in which C_w is the working capacity, C_d the distributed capacity, and R_{ac} the equivalent parallel a.c. resistance. The total capacitive reactance X_{ct} is calculated from Eq. 5, using the sum of these two capacitances. The total impedance across terminals A and B is given by

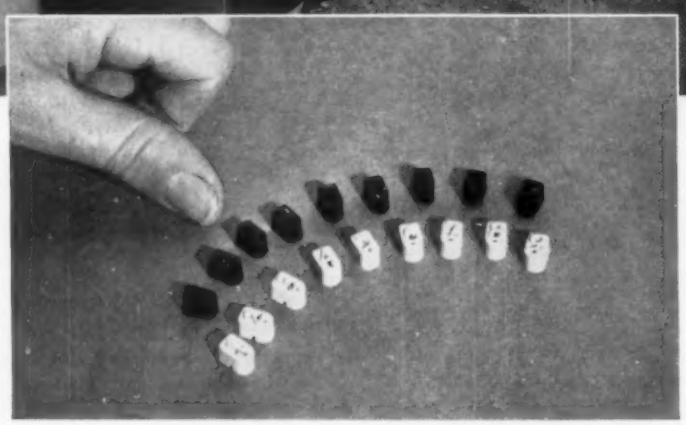
$$Z = \frac{-j\,R_{ac}\,X_{ct}}{R_{ac} - jX_{ct}}$$

$$= \frac{R_{ac}\,X^2_{ct}}{R^2_{ac} + X^2_{ct}} - j\,\frac{R^2_{ac}\,X_{ct}}{R^2_{ac} + X^2_{ct}} \qquad \text{Eq. 7}$$

Since θ is the angle whose tangent is R_{ac}/X_{ct}, the power factor in this circuit is $\cos\theta = R_{ac}/(R^2_{ac} + X^2_{ct})^{0.5}$. Since increasing either the stray or working capacity increases X_{ct}, and reduces $\cos\theta$, it also raises the impressed voltage required to obtain sufficient heating current through the lossy component R_{ac} of the load. The

[3] There has been much confusion over the similar but not equivalent terms: power factor, dissipation factor, loss factor, loss angle. These are clearly defined in A.S.T.M. test D 150-54T in A.S.T.M. Standards on Plastics, published by the American Society for Testing Materials, Philadelphia, Pa.

The Stokes Model 701 press installed in the Bristol, Va. plant of Monroe Calculating Machine Company. Operation is completely automatic . . . is unattended except for loading of the hopper and removal of finished parts.





Nine separate pieces are produced at one time. These numerical inserts later have the flush facing molded around them—are used as keyboard buttons on calculating, adding, and accounting machines.

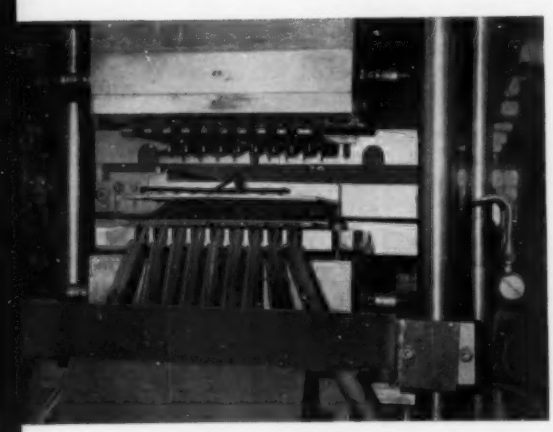
Monroe Calculating Company saves . . . with automatic molding, de-gating, sorting on Stokes 701 injection press

Monroe Calculating Machine Company, world famous for its quality machines and progressive engineering outlook, is ever on the alert for new, more advanced manufacturing methods. It discovered, in the Stokes 701, an improved and more economical method for molding numerical inserts for keyboard buttons.

The Company automatically molds and sorts the inserts . . . 9-at-a-time . . . at its Bristol, Va., plant. The Stokes 701 automatic injection machine operates virtually unattended . . . has provided a 13% increase in production, and has reduced man-hours by over 85%. As a result of this experience, Monroe has purchased 2 additional Stokes 701's . . . one for its Orange, N.J., plant, the other for Monroe-Holland in Amsterdam.

The Stokes Model 701 machine often economically replaces 4-ounce or larger machines since freedom from the labor factor allows the number of cavities in the die to be planned for optimum production requirements. It does not require special attachments or extra-cost gimmicks. The automatic features are integral. Its precisely repeated automatic cycles provide a higher degree of uniformity and quality of finished parts. The patented Stokes ejection system positively clears all parts and runners from the die. Secondary protection is provided by the use of the more common low-pressure close. The completely self-contained vertical design of the Stokes 701 saves floor space . . . permits easy attendance . . . and facilitates mold set-up.

Write for your copy of literature on the Stokes Model 701—the truly automatic 2-ounce injection molding press. Ask for a Stokes production analysis on your own parts.



Close-up of the die table shows the sprue and runners about to be pushed down the slide (foreground) to the scrap barrel. The nine finished parts are funneled into nine separate bins via the tubes at the base of the die.

Plastics Equipment Division
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STOKES

working capacity is needed, but obviously the stray capacity should be minimized.

How it's done

The basic sealing technique consists of loading one or more thicknesses of film into a low-pressure air or hydraulic press, the ram of which assures good contact between the work or load and the die. The alternating electric field is applied for a controlled period of time and magnitude while top pressure is exerted on the load. A cooling cycle is frequently used after the heating cycle. The press is then returned to its starting position.

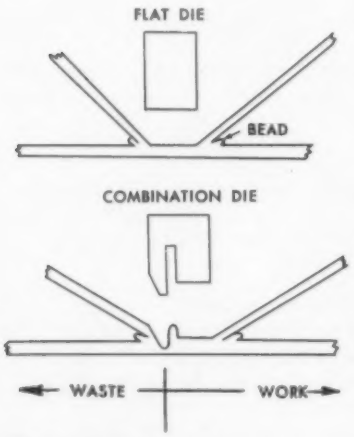


Fig. 6: Two types of heat-sealing dies: plain sealing die at top, combination tear-sealing die at bottom. Tear seal eliminates trimming of edges

To further clarify the process of heat-sealing, each element involved will now be considered separately.

Press. The conventional press is of C-frame construction. The upper plate is used to mount the die and in many cases to lend it mechanical rigidity. This plate is adjustable to the ram and can be used to level the die with respect to the lower platen.

Pressure in the range of 100 to 500 lb./kw. of output power is used to insure fusion of adjacent layers of film. This force must be exerted smoothly and with sufficient follow-through during the heating cycle to allow for extrusion or thinning of the material. Scuffing is to be avoided.

In some presses resistance heating of the upper plate keeps the die temperature up. This permits the construction of multi-color appliques, and avoids die warm-up problems. Excessive temperatures must be avoided to prevent die damage and weak seals.

Dies. The dies are customarily constructed of brass strip or rule, fastened to a backup plate of brass or aluminum or steel. The rule measures from ½ to 4 in. wide and up to ⅛ in. thick. Segments are soldered in position or bolted in place with metal angles. The sealing edge of the rule may be flat or notched to produce a desired pattern. Significantly, electrode thicknesses over ⅛ in. do not appreciably increase the strength of the seal.

Tear seals are accomplished by sharpening the electrode on one side. This allows the material to flow out from under the electrode and weakens the film under the sharp edge; final tearing of the film is done by hand.

In a combination tear and sealing die the height differential of the tear and sealing face is dependent upon the thickness of the materials to be used. The differential is generally ⅛ to ½ the total layup thickness. See Fig. 6, at left.

Because the die is essentially an electrode as well as a pattern, certain rules regarding its construction are followed. Die height is a compromise between mechanical rigidity and the electrical phenomena of standing waves. This will be discussed later. Increasing die height limits stray capacity to a certain extent. All surfaces that contact the work must be smooth and all edges must be slightly rounded, otherwise concentration of electrical field lines will result in flashing or burning of the work.

Trays and jigs. The material to be sealed, usually die cut, is placed in a tray on the lower plate. The construction of the tray is such that the film falls into a pattern cut from Masonite. Generally the tray is backed by aluminum. The die must be kept away from the Masonite surface to prevent flash-over. Locating pins are sometimes used for multi-layer applications. It is not unusual to see a 6-to-1 film thickness variation on a single tray.

Occasionally, spring-loaded jigs are used, where the die faces upward and the work is placed on the die within the confines of a spring loaded Masonite or XXX phenolic laminate pattern. In this case, the leveling plate becomes a sealing platen. This upside-down method is employed in those instances where two dissimilar sizes or shapes of film must be fastened together.

When zippers or pleats are to be used, special jigs with notches and hinged segments facilitate quick and easy positioning of the component parts. When a given layup is time-consuming, more than one tray is used, with an appropriate number of operators loading the trays and feeding them to one machine.

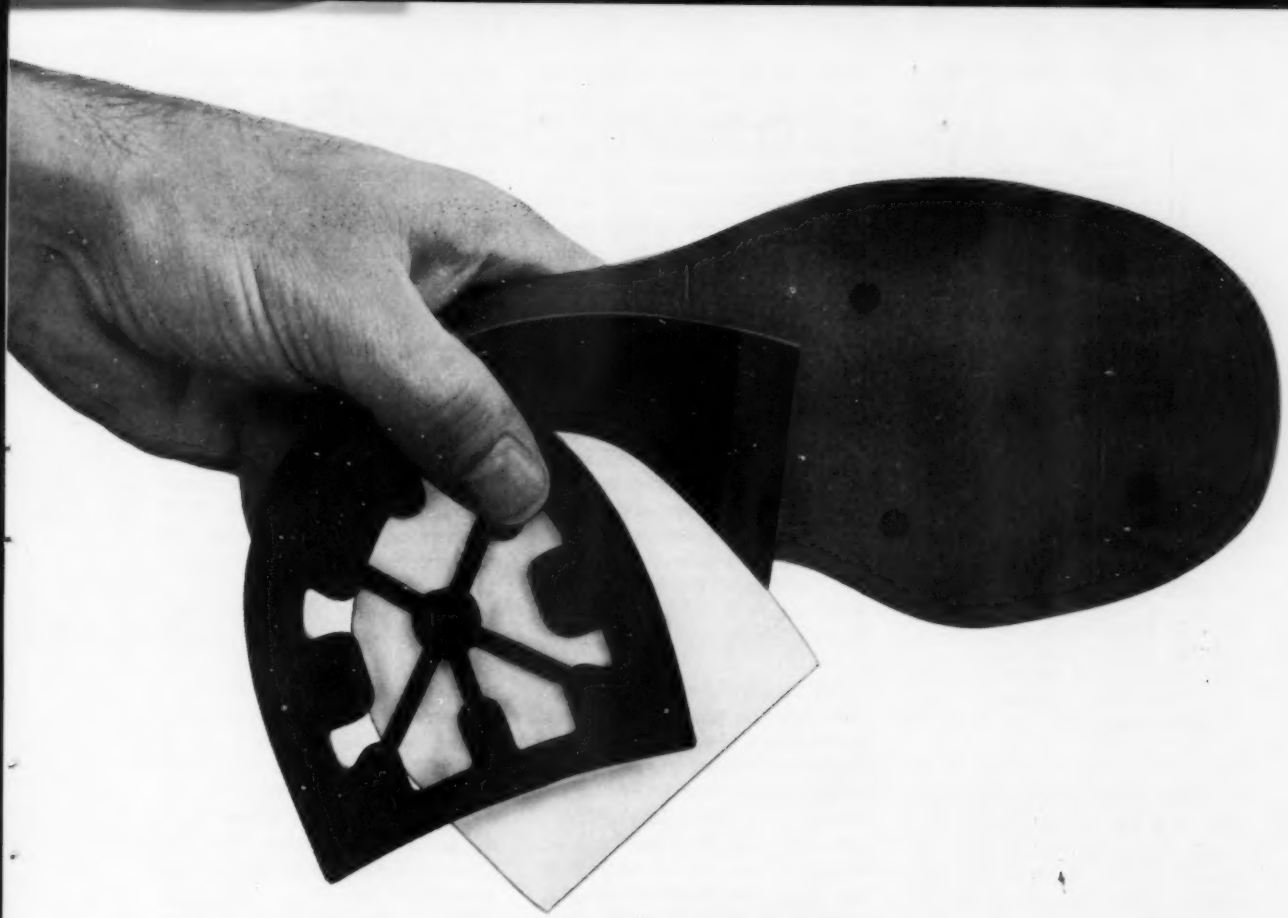
Generator. The electronic equipment necessary to produce the radio-frequency energy in sufficient magnitudes to complete a seal is composed of a power supply, an oscillator, and control circuitry.

The power supply converts the 60-cycle line voltage to a high level d.-c. potential required by the oscillator tube. Because this potential is dangerous to life, an interlocked door and other safety devices are frequently employed.

In the oscillator, the high-voltage d.c. is converted to a.c. in the frequency range of 10 to 40 megacycles. Sufficient current must be available at the output terminals to generate heat in materials with low power factor and large amounts of distributed capacity. The output ratings of the equipment are usually in the range of ¼ to 100 kilowatts.

The control circuitry ties together the action of the press and generator as a whole. It protects the components within the generator. It provides, when required, for operator safety. It controls the period or time of r.-f. application and cooling time. It facilitates warm-up of the tubes within the generator.

Modern generators are equipped with an arc anticipator,



Shoe parts of **TENITE POLYETHYLENE**

offer better flexibility
easier workability
improved moisture resistance
longer life

Plastics are becoming more important every day in shoe construction. The midsole, Dutchman heel pieces, and heel base shown above, for example, illustrate new uses of Tenite Polyethylene by Endicott-Johnson Corporation, a leading name in the shoe industry.

Tenite Polyethylene is a plastic with properties useful to shoe manufacturers. It is light in weight and resists chemical attack, aging and moisture. It is easy to form; parts can be molded, or cut from extruded sheet. It can be supplied in colors.

Endicott-Johnson cite numerous benefits from their use of Tenite Polyethylene. Dutchman heel pieces, they report, formerly were made of fibre and leather. By using Tenite Polyethylene, they now have a material more adaptable to rounding and skiving, which permits production of better-fitting shoes. The new heel pieces also have greater flexibility and moisture resistance—two important considerations for any heel piece.

Their heel bases formerly were made of rubber. By switching to plastic, Endicott-Johnson feel that their new bases are more serviceable and that quality control has been made more precise.

Midsoles formerly were made of leather. Here again, the change to polyethylene has meant improvements in workability, flexibility and moisture resistance.

Today, many industries are using Tenite Polyethylene in place of traditional materials. Perhaps you, too, have a product that could be given improved performance or longer life if made of this versatile plastic. For more information, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

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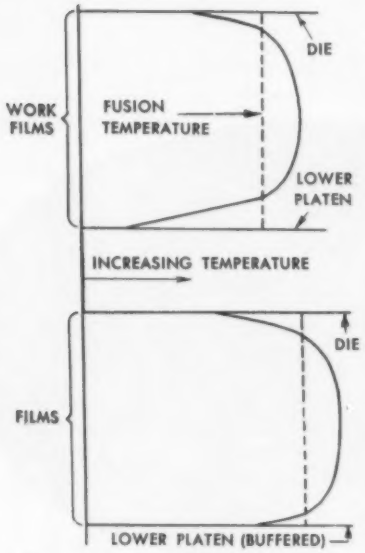


Fig. 7: Temperature distribution in films being dielectrically heated without (top) and with (bottom) buffer on lower plate

a safety device that protects the dies and trays. Essentially, this device measures the leakage resistance of the work during the sealing cycle. Should this resistance fall below an adjustable preselected value, the anticipator almost instantaneously quenches oscillations. Falling resistance is caused by dirt and metallic particles in the work, flashing around the work, and excessive extrusion beneath the die.

Because sudden full application of the applied voltage frequently results in flashing, a method has been devised which applies the output voltage at a minimum value, building up slowly towards maximum, at the start of each cycle. This technique, called "step starting," is, in modern equipment, adjustable in speed.

The r.-f. cycle

The r.-f. cycle is generally less than 4 seconds. If longer periods are required, a larger generator is needed. Basically this is a thermal problem. The heat which is induced in the work at a certain rate tends to be transferred to the dies and platens. If the thermal conduction is good, then the temperature built-up in the work will be limited. To prevent this loss of heat a thermal buffer or insulator is used. The buffer generally consists of XXX phenolic—laminate natural paper base, or fish paper in thicknesses ranging from 5 to 30 mils. Unfortunately, the buffer itself has a moderately high power factor and heats in the electric field. On the other hand, it has resilience, which helps to mask small irregularities of the die.

A typical temperature distribution curve is shown in top diagram of Fig. 7, left. With buffer on the lower plate, higher temperatures are experienced at the interface of buffer and work as shown in lower part of Fig. 7. It must be remembered that the rate of heating is uniform throughout the thickness of the work, but the temperature is not because of the thermal conductivity of dies and plates.

Taking into accounts various formulations of PVC sheeting, construction of dies and jigs, and the use of buffers and other conventional techniques, a chart of sealability is shown in Fig. 8, below. This may be used for seals requiring 4 sec. or less and where tear seals are calculated roughly as 0.085 to 0.125 in. wide. When the total bed plate area of the die is large in comparison to the sealable area, this chart must be derated about 50 percent.

Thicker sections of film are more readily heated than thin sections. This is due to a higher ratio of C_w to C_d, and to the longer heat transfer path.

Cooling cycle

If the dies are removed while the seals are still soft, the seal deforms and cools in an uncontrolled fashion. A cooling period, under pressure, of approximately 0.1 to 2 sec. greatly enhances the strength and shape of the seal. Though the die is warm to the touch, it is considerably below the melting temperature of the film. Excessive cooling time may result in too high a die temperature, which in turn may cause sticking and needless loss of production time.

Standing waves

When higher frequencies are used in an effort to reduce the applied voltage or to heat materials with small polar moments, or when large dies are used, standing waves often occur. This phenomenon is characterized by non-uniform voltage distribution at the die face which results in uneven heating. Efforts to compensate are frequently mishandled by using shims in the area of the weak seals. One of the most frequently employed procedures to correct standing waves is to utilize "stubs," which are electrical inductances that alter the impedance of the die at and near the point of application. This enables even the largest dies to appear flat for standing wave ratios within a tolerance of ±5 percent. Though this particular method is complicated, it is economical.

Shielding

The Federal Communications Commission has assigned certain frequencies where unlimited spurious radiation is permissible. In practice it is economically infeasible to build equipment which complies with Part XVIII of the regulations. A cheap and convenient method of compliance is to construct a screened room equipped with radio interference filters around the machine.

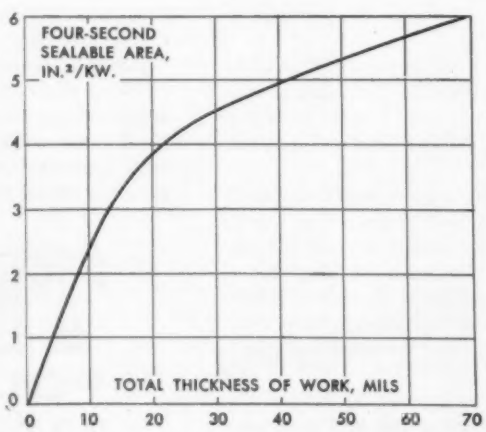


Fig. 8: Sealability chart for dielectric sealing of vinyl film

Molding shrinkage and related effects in a fixed-cavity compression mold

Part 2

*By W. R. McGlone and L. B. Keller**

Part I of this report, covering factors influencing molding shrinkage in landed and unlanded molds, appeared in the February issue, p. 125. Presented here are data showing that the density of non-porous parts is practically uninfluenced by changes in molding conditions, except in special cases.

The thermal coefficients of expansion of most of the compounds investigated were greater in the vertical (force) direction than in the lateral (flow) direction, primarily because of filler orientation and difference in coefficients of expansion between filler and resin. Expansion coefficients change with repeated reheating, settling down to minimum values.

Molding shrinkage factors, indispensable in mold design, can be determined with good precision, as illustrated by values for Diall 50-01. Similarly, with the aid of statistical methods, the precision of molding, which sets an ultimate standard of reproducibility in compression moldings, can be determined. The 95% confidence limits of piece diameter for seven typical thermosets range from ±0.19 to ±0.76 mils/in. under the conditions of this study.

Although it has been shown that pressure has a direct bearing on the dimensions of a molded part, it is of interest to know whether molding pressure is reflected in the density of well-molded, non-porous parts. To determine the effect of pressure on the density of such parts, an experiment was carried out in which every effort was made to prevent gaseous inclusions from occurring in a set of molded parts; it is obvious from the observations of Part I that voids will significantly lower the over-all specific gravity of the parts.

Parts were molded with the lands removed from the mold and with molding pressures of 2500 and 7500 p.s.i. The mold was used unlanded so that full pressure could be transmitted to the parts. The specific gravity of each part was found by accurately weighing it in air and water. After determination of the specific gravity, parts were sectioned, polished, and examined visually for voids. All parts were considered void-free except as noted. Table III, p. 118 (Tables I and II appeared with Part 1), shows the effect of molding pressure on the specific gravity of the parts. Notice that the parts were molded to substantially the same specific gravity. A change in specific gravity of about 0.01 in a part having about the same specific gravity as Diall 50-01 would correspond to a change of about 2.4 mils in height or 17 mils in diameter.

Further work was conducted on Diall 50-01 to evaluate the effect of charge weight on the specific gravity of the material in a *landed* mold. The results are given in Table IV, p. 119.

Again the material showed virtually no change in specific gravity. This is in contrast to the significant change in gravity with charge weight for the Durez 16274 material already discussed. The difference of about 0.027 in specific gravities between the parts in Tables III and IV and those in the dry-ice experiments reported on p. 132 of Part I is due to a slight formulation change between material batches.

The density of the Durez 14482 compound was also sensitive to changes in charge weight as Table V, p. 119, shows. This difference in density is probably due to the

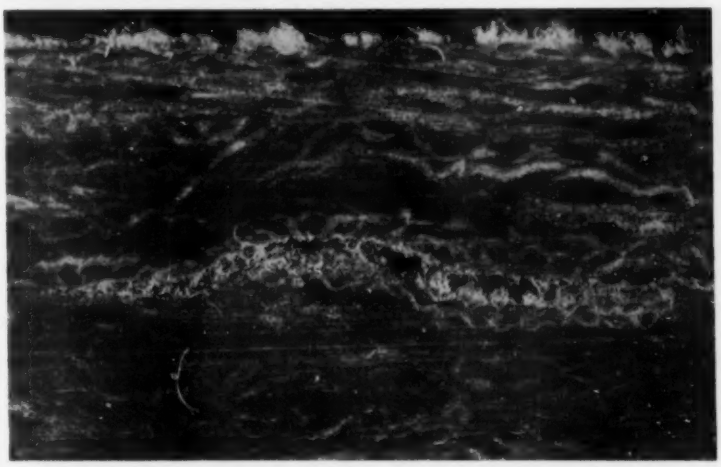


Fig. 14: Fissure-type porosity in a part molded from Durez 14482 phenolic material, enlarged 9X

*The work reported was done at the Research Laboratories of Hughes Aircraft Co., Culver City, Calif. where Mr. Keller is still located. Mr. McGlone's present address is Plastics Div., Curtiss-Wright Corp. Quehanna, Pa.

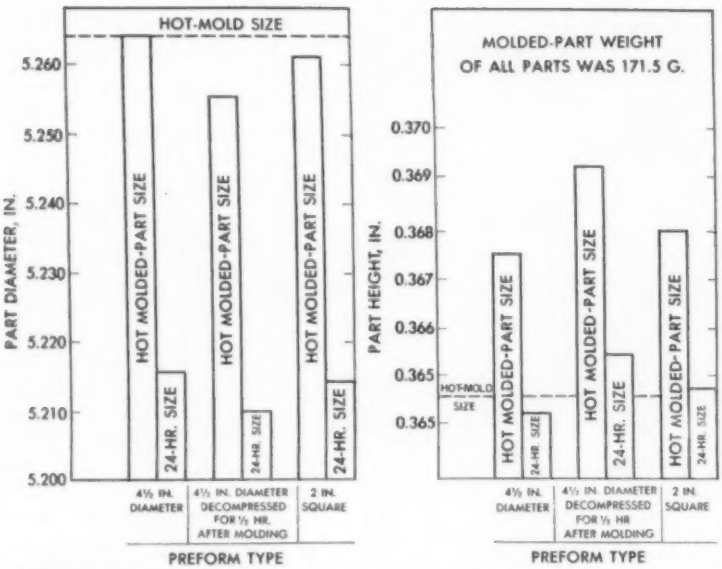


Fig. 15: Effect of preform size and of decompression in mold on molded-part dimensions

evolution of volatiles by the resin or to the entrapment of air during molding. Here, as with the Durez 16274 specimens, low charge weight and accompanying lower effective pressure produced parts of low density. Figure 14, p. 117 (Figs. 1 through 13 appeared in Part 1), shows severe porosity (fissure type) in one of these parts of low effective charge weight.

The specific gravities of these same parts (Table V), after they had been reheated to obtain thermal contraction measurements, were all slightly lower than they had been immediately after molding.

Memory of molded parts

In order to demonstrate the "memory" effect and to show that it is somewhat time-dependent, parts were molded of Diall 50-01 for 18 min.; the pressure on the mold was released and the punch was raised about 0.5 inch. The parts were left in the mold for 30 min. before ejection. In Fig. 15, left, the height and diameter of a part decompressed in this manner are compared with those of parts made from preforms 4.5 in. in diameter and 2 in. square that were molded for the same time and ejected immediately. The part heights are plotted on a scale seven times that used for the diameter so that changes in height and diameter reflect approximately equal volume changes (see Appendix I of Part I). Study of the figure reveals the following: 1) The part made from the 2-in.-square preform came from the mold smaller in diameter and larger in height than that made from the 4.5-in.-diameter preform. Also, immediately upon ejection this part had a smaller diameter than the mold. 2) The part made from the 4.5-in. preform and decompressed for 30 min. at 300° F. had a considerably smaller diameter and larger height than the part made from the same size preform that was ejected immediately after removal of the press load.

From these observations it may be concluded that the "memory" effect can be increased by increasing the flow in the mold during molding (Item 1 above) and that complete "memory" does not occur immediately after removal of pressure (Item 2). Additional

Table III: Effect of molding pressure on molded-part specific gravity

Material	*Specific gravity at 25° C. — Molding pressure* 2500 *p.s.i.*	7500 *p.s.i.*
Diall 50-01	1.316	1.317
	1.317	1.318
	1.318	1.318
Durez 1905	1.492	1.492
	1.493	1.493
	1.494	1.493
Durez 16274	1.729	1.732
	1.730	1.731
	1.7196 (large blister)	1.732

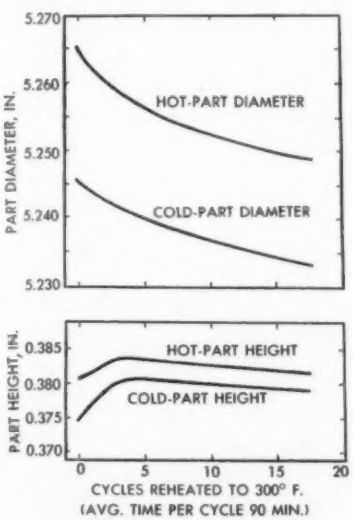


Fig. 16: Change in dimensions of Durez 14482 molding after repeated reheating to molding temperature

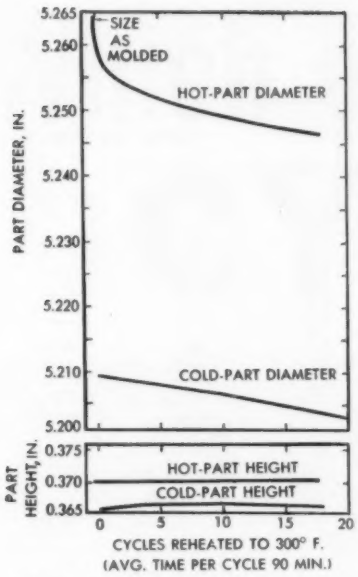


Fig. 17: Effect on dimensions of repeated reheating of Diall 50-01 moldings

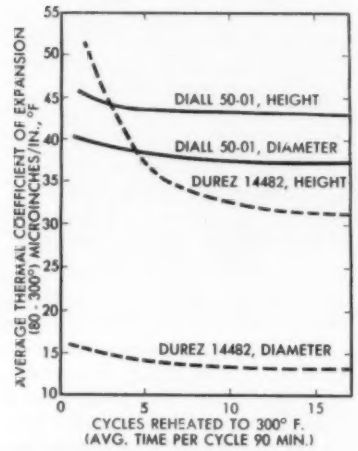


Fig. 18: Thermal expansion coefficients of Diall 50-01 and Durez 14482 diminish with repeated reheating to molding temperature

cure does not explain the behavior of the decompressed part since the part grew as much or more (volume-wise) in the height direction as it shrank diametrically. Also, the cure of such a specimen has been shown to be substantially complete after 18 minutes (3)[1]. Plastic deformation of the part from pressure exerted by the sides of the mold does not explain this "memory" effect since the part came from the mold with a much *smaller* diameter than that of the mold.

[1] Numbers in parentheses link with references listed at the end of Part I of this article.

Coefficients of expansion

Early in the program, parts used in the cooling-curve measurements were reheated to the molding temperature in an oven, immediately transferred to the measuring device (Fig. 1, Part I), measured for height and diameter, and then measured again at room temperature 24 hr. after removal from the oven. Since parts did not return to exactly the same size after the reheating, it was decided that study of these changes would be of interest. The reheating process was repeated for several cycles and it was found that the expansion coefficient calculated from the data approached a minimum value in every case. The first heating and cooling cycle was ½ hr.; all subsequent cycles were 1.5 hours.

Figures 16, p. 118, and 17 show curves of the data obtained by the method described above for Durez 14482 and Diall 50-01. The changes in room-temperature height and diameter with successive reheatings are attributed to stress relief, generation and/or loss of volatiles, and additional cure.

Coefficients of expansion computed from these data are shown in Fig. 18, left. The other materials showed similar changes. Much of the change in the coefficient of expansion with repeated heating may be attributed to loss of water or other volatiles. All materials lost weight throughout the reheating process. Diall 50-01 had a weight loss after 17 cycles of 0.2%; Durez 14482, 1.3%; Durez 1900, 1.5%. The weight loss of Bakelite BM-120 was 1.3%; and that of Heresite M-66-20, 1.4 percent.

Final or equilibrium values of coefficient of expansion obtained are given in Table VI, p. 120. These coefficients are not actually constant over the temperature range involved (80 to 300° F.); the values of Table VI are mean values over that range. For the purpose of molding-shrinkage calculations, which involve only molding temperature and room temperature, they should be useful. This variation helps to explain the difference between the average values over this temperature range and those presented in

Table IV: Specific gravity of Diall 50-01 at varying charge weights

Charge weight	*Final molded-part weight*	*Specific gravity at 25° C.*
g.	*g.*	
165	163.86	1.317
	163.99	1.317
	163.61	1.317
180	171.96	1.318
	172.07	1.318
	171.93	1.318

Table V: Specific gravity of Durez 14482 at varying charge weights

Charge weight	*Final molded-part weight*	*Specific gravity at 25° C.*
g.	*g.*	
185	182.99	1.3788
	182.63	1.3777
170	168.58	1.3519
	168.83	1.3405

Table VI: Coefficient of expansion of various materials[a]

	First reheat		17th reheat (Equilibrium)			After humidity	
Material	Diameter	Height	Diameter	Height	Height/diameter ratio	Diameter	Height
Diall 50-01	39.0	44.4	37.3	43.9	1.2	40.4	45.3
Diall 794B[b]	—	—	25.5	31.7	1.2	26.7	32.8
Durez 1900	24.2	37.4	19.4	34.0	1.7	—	—
Durez 1905[b]	—	—	17.1	24.3	1.4	—	—
Durez 16274	17.1	25.3	12.8	16.4	1.3	13.5	18.3
Durez 14482	15.4	51.0	12.7	30.2	2.4	13.4	35.2
Bakelite BM-120	29.8	47.3	22.7	39.0	1.7	—	—
Heresite M-66-20	43.5	39.4	34.4	29.0	0.85	—	—

[a]All values are given in microin./in., °F. over the temperature range 80 to 300° F.
[b]Stored 12 months before reheating.



Fig. 19: Orientation of glass fibers in Diall 794B, enlarged 75X

Table II of Part I for the range of 60 to 110° F.

The effect of absorption of water on the coefficient of expansion was looked into. Specimens from the previous series were placed over water at 160° F. in a closed container for 100 hr., removed from the container and allowed to dry at room temperature for 4 hr.; they were then heated to 300° F. and measured as before. As the results in Table VI show, the humidified parts had higher expansion coefficients than the dry parts.

The Diall 794B and Durez 1905 specimens and some of the Diall 50-01 specimens had been molded for a previous investigation and had been stored for 12 months before being reheated for these measurements. These Diall 50-01 specimens showed substantially the same coefficients of expansion as the freshly molded parts.

In Table VI, note especially the big differences in the coefficients for the height and diameter directions. In the materials having the fibrous fillers and with the amount of flow in the mold present in these tests, it was expected that the predominant fiber orientation would be lateral rather than vertical so that the resin would be free to contribute more to the vertical expansion coefficient.

Correspondingly, the fibers would tend to resist lateral changes. Figure 19, left, shows such an orientation of the very short glass fibers in Diall 794B material. Notice that, except in the case of the Diall 50-01, the fiber-filled materials have the greatest difference in expansion coefficient between the two directions; however, even the mineral-filled materials showed some difference. The Orlon filler in the Diall 50-01 has a high coefficient of its own, so the difference between resin and filler is less. The unfilled phenolic molding material (Heresite) had a coefficient of expansion that was slightly higher in the lateral than in the vertical direction.

The greatest difference was noticed in Durez 14482; the small squares of cloth filler in this material are quite likely to orient as laminae or platelets. Figure 20, p. 122, which shows the cross-section of a specimen made from Durez 14482, reveals this laminar orientation of the filler. The picture was taken near the outside of the disk where the flow was greatest. A similar effect—namely, higher coefficient of expansion

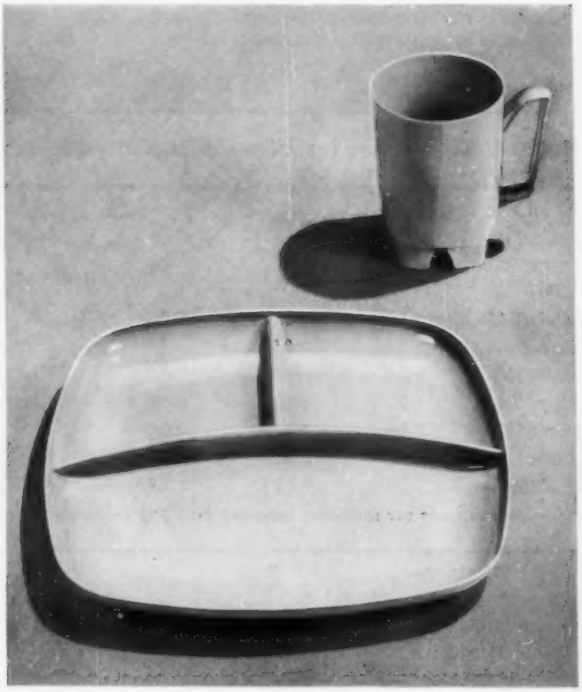
Table VII: Hardness of moldings specimens[a]

Material	Cure	Hardness, Rockwell M	
		As molded	After ½ hr. reheat at 300° F.
	min.		
Diall 50-01	3.5	102.1	104.3
	18	106	105.9

[a]All values are the average of five measurements of each of two specimens

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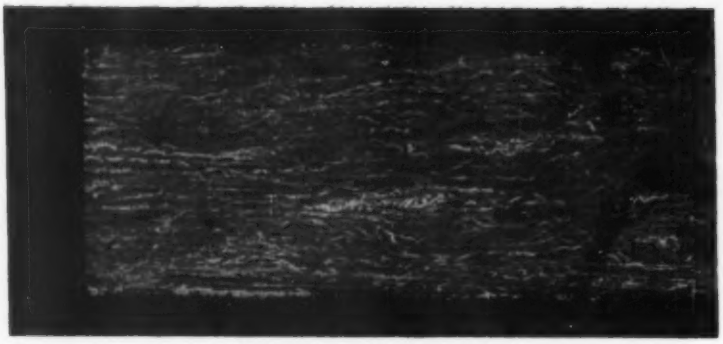


Fig. 20: Cross-section of part made from Durez 14482, showing filler orientation, enlarged 3.7X

Table VIII: Molding precision obtained in experimental tests

Material	95% limits of part diameter		99.7% limits of part diameter		Number of measurements[a]
	mils	mils/in.	mils	mils/in.	
Diall 51-01	±3.0	±0.71	±5.6	±1.07	52
Diall 50-52	±3.0	±0.57	±4.5	±0.86	54
Diall 794B	±2.6	±0.50	±4.0	±0.75	30
Alkyd 440A	±4.0	±0.76	±6.0	±1.13	30
Durez 16274	±1.0	±0.19	±1.6	±0.29	54
Durez 1905	±1.4	±0.27	±2.2	±0.42	210
Diall 50-01	±1.2	±0.23	±1.8	±0.35	328

[a]Two measurements per specimen; specimen size: 5.19 in. in diameter by 3/8 in. thick.

perpendicular to the laminations —has been observed in glass-cloth laminates (6).

Hardness of moldings

The hardness of the Diall 50-01 and Bakelite BM-120 specimens was determined in order to learn whether or not the continuation of cure after ejection would bring parts molded for shorter times to the same level of hardness as those cured for the longer time. Hardness is an index of degree of cure in these resins. The hardness was measured per ASTM-D-795, Method A, and the Rockwell M scale was used. The data for Diall 50-01 are given in Table VII, p. 120. They show that the continuance of cure in the short-time-molded parts was not as effective as longer cure in the mold. There was an increase in hardness of the sorter-cured parts after reheating, but even ½ hr. at 300° F. did not bring the parts to quite the same hardness.

The Bakelite BM-120 specimens, however, did reach a hardness of 113 to 114 Rockwell M for both 3- and 7-min. cure, both as molded and after reheating.

Use of molding-shrinkage data

The molding-shrinkage factor used in mold design is defined by:

$$F = (M - P)/M$$

where F = the shrinkage factor,
M = the mold dimension at room temperature, and
P = the part dimension at room temperature.

The molding-shrinkage factor determined in this way is normally applied in mold design according to the approximate formula

$$M = P(1 + F)$$

When large dimensions or high shrinkages are involved, the exact formula is used:

$$M = P/(1 - F).$$

Along with the preceding basic investigations, an attempt was made to establish molding-shrinkage factors for use in mold design. Parts were molded of various materials over a wide range of molding conditions and the results were analyzed statistically. This work will not be presented in detail here, but one typical set

(*To page* 189)

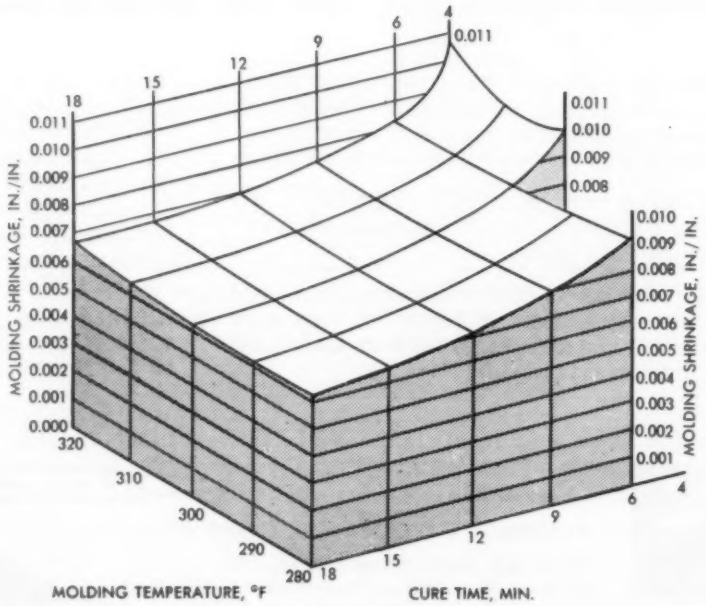


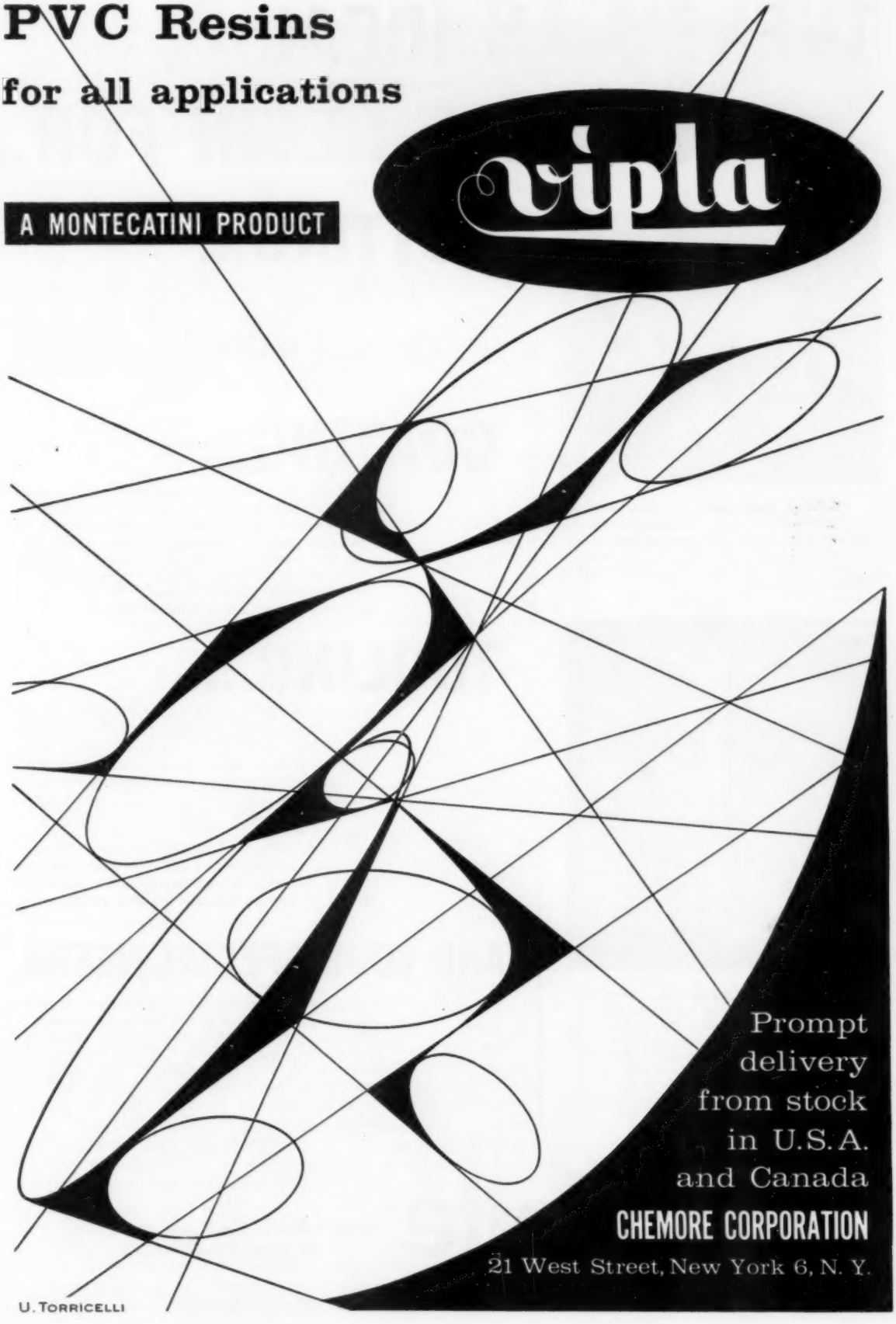
Fig. 21: Effect of cure time and temperature on molding shrinkage of Diall 50-01

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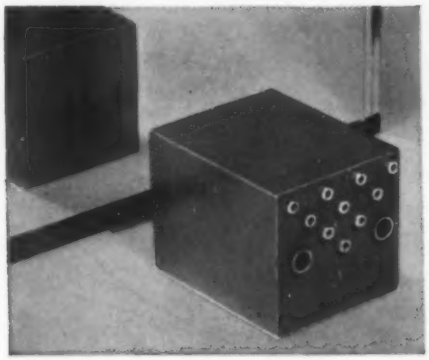
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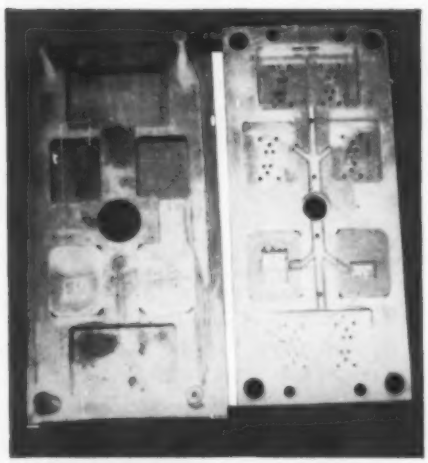
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The polyolefin plastics field—

present technical status

By Frank C. McGrew†

It is widely recognized that the subject of polyolefins is extremely broad and diverse in a technical sense. It is the purpose of the present paper to attempt to picture this subject in a rational way, that is, to integrate the relationships of various polyolefins and various polyolefin properties into a comprehensive frame of perspective.

Even a brief acquaintance with polyolefins confirms that they have use value not because of single properties but because of combinations of properties, and these combinations differ from one group of applications to another in a complex way. Furthermore, the new polyolefins just now becoming available for evaluation, as well as those which have so far only been described in journal articles and patents, give us reason to examine most searchingly what properties and combinations of properties are the source of use value in the established and prospective commercial areas.

An aid to understanding of the polyolefins may be developed from a high-spot look at the history of this class of plastics. The first commercial use of polyethylene in the middle 1940's was for extrusion coating of wire and cable. This use was the direct result of the electrical properties of polyethylene — properties which, assuming freedom from contamination and degradation, are inherent in polyethylene and not a variable property to be manipulated for this or that market area. In other words, commercial grades were not distinguished on the basis of these properties, but at a very early stage it became apparent that extrudability, that is, flow properties, were highly important in setting commercial value. This led to the setting of specifications based on the results from a standard flow test (Fig. 1). Although the first scale of flow involved tests that have since been outmoded, to simplify the story this presentation employs throughout the precise scale of melt index, which has become the standard of the industry. Processability of polyolefins has remained such an important element of market value that the melt-index scale introduced in the first market area continues to be a primary means of distinguishing commercial resins throughout the polyolefin business. Accordingly, it is always one of the dimensions on the maps to follow.

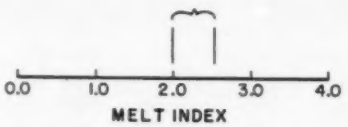


Fig. 1: Specification of early polyethylene from wire coating requirements

In the second phase of polyethylene history, which overlapped the first, the growth of film uses made it apparent that measurement of flow was not sufficient to distinguish commercial resins. There was, to be sure, a need to eliminate fish-eyes, haze, color, odor, and improve

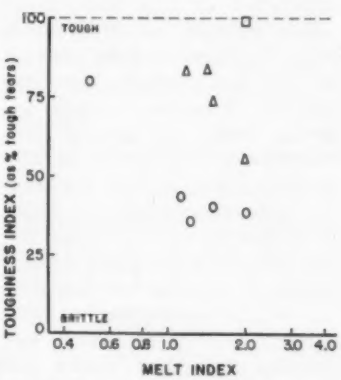


Fig. 2: Map of early polyethylenes in terms of film requirements. (Symbols represent typical commercial offerings that were available at time of study)

* Reg. U.S. Pat. Off.

Presented as the technical introduction to the Symposium on Marketing of Polyolefins, sponsored by Division of Chemical Marketing and Economics, American Chemical Society, New York, September 11, 1957.

† Assistant Director of Research, Polychemicals Department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

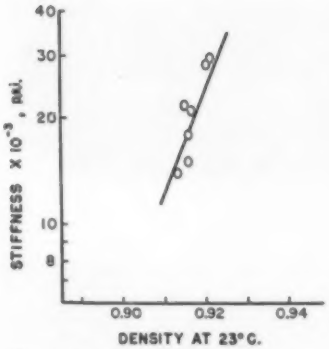


Fig. 3: Dependence of stiffness on density of early polyethylenes

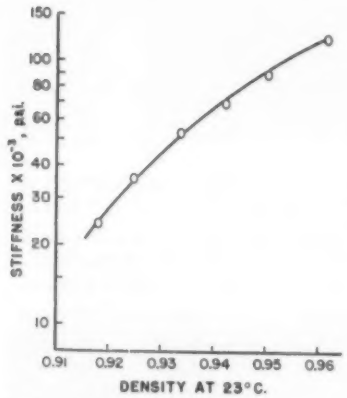


Fig. 4: Dependence of stiffness on density for full polyethylene range

transparency; but although these properties are important, they are not useful for mapping purposes. Film uses, however, put a premium on resistance to failure when stressed. This might be manifested as tear strength or impact strength, either of which might be measured by any of several test methods. For the moment these are lumped together under the general term "toughness". Figure 2, p. 125, illustrates one way of picturing the early commercial film resins on a map drawn to highlight the two properties of great significance for the film market, flow and toughness. Obviously, there is much more to be said in explaining why these resins are scattered over the map as they are and in bringing in the more subtle properties we now recognize as vital to the film market. But for the purpose of this quick look at past history, it will suffice to observe that the emergence of this market added a second dimension to the domain of polyolefins.

In the third phase of the early commercial history of polyethylene, use as a molding resin began to grow. In moldings it was immediately apparent that part of the value of polyethylene depended upon its stiffness. This property could be varied by controlling density of the resin through manipulation of synthesis variables. Figure 3, left, shows the relationship of stiffness to density on which this manipulation was based (1).[1]

Density has continued to be a useful criterion of value up to the present time because there is also a fixed relationship between stiffness and density for the more recent medium-density and high-density resins (2) (Fig. 4, left). Although this is not exactly a straight-line relationship, it does show the suitability of density as a third distinguishing feature or mapping parameter useful over the whole range of polyethylenes.

Another reason why density has been so widely useful in specifying polyethylenes for various classes of applications is that it gives a pretty good measure of temperature resistance, which is significant, for example, in wire and cable coverings and in boilable containers. Figure 5, above, illustrates this relationship in terms of the Vicat temperature (1).

Again, specification of density takes pretty good care of abrasion resistance, which is important especially in wire and cable coatings and in appliance housings. Figure 6, right, illustrates the trend to better performance in an abrasion test with increasing density of polyethylenes (3).

Furthermore, density is often the most useful indicator of permeability to solvents and oils, which is important in many packaging uses. Figure 7, right, shows the trend to decreasing permeability toward a typical solvent and a test oil with increasing density of polyethylene (4).

The foregoing charts provide ample reason for considering density of polyethylene as an important mapping coordinate. If density is used, along with flow, the map in Fig. 8, p. 128, is obtained; this spreads out in interesting and significant fashion

[1] Numbers in parentheses link to references at end of article, p. 133.

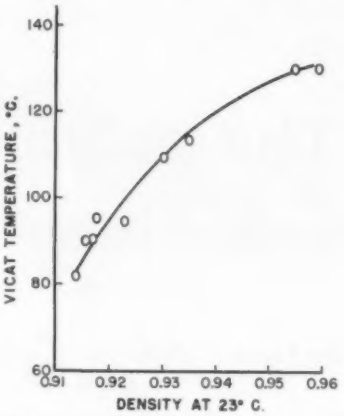


Fig. 5: Dependence of temperature resistance of polyethylenes on density

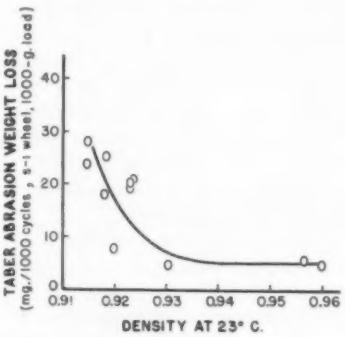


Fig. 6: Dependence of abrasion resistance of polyethylenes on density

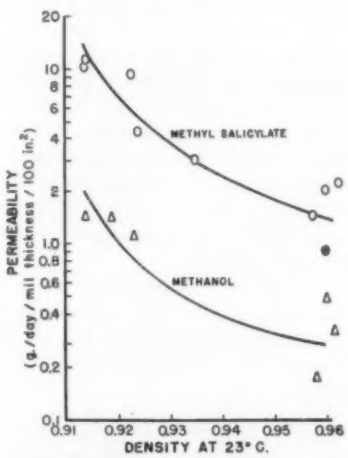


Fig. 7: Dependence of permeability of polyethylene on density

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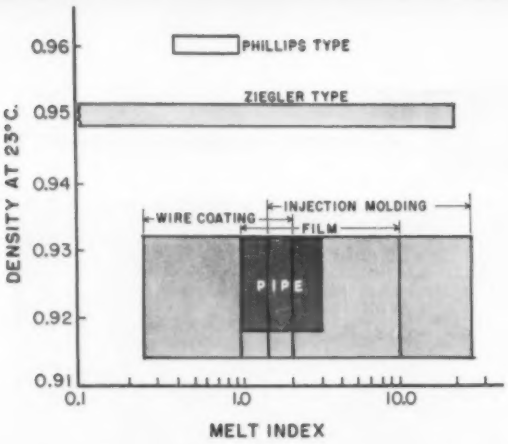


Fig. 8: Density-versus-flow map of commercial polyethylenes

the commercial free-radical polyethylenes designed as wire-coating, pipe, film, and injection molding plastics, respectively.

At densities higher than those of the commercial free-radical polyethylenes lies an extensive area of potential products that are at an earlier phase of market development. These are properly called "high-density" or "linear" polyethylenes rather than "low-pressure" polymers because they were first obtained experimentally, over ten years ago, at very high pressures. However, commercial development of this area has been more recently accelerated by the discovery, independently in several laboratories, of various low-pressure processes; products from these processes so far offered on a commercial basis are represented by the boxes labeled "Phillips-type" and "Ziegler-type".

How high-density products relate to the market areas represented in the other boxes on this map is not clear from a consideration of density and melt index alone and this fact has been responsible for much of the uncertainty about the commercial future of the newer polyolefins. One reason is that it is impossible to locate a polyolefin with respect to the extensive and complicated range of use-values of the present day without specifying a third basic resin parameter. This gap may be illustrated in various ways; for example, in terms of toughness, which has already been shown to be a primary determinant of value for polyolefins. Figure 9, below, shows the results of an attempt to correlate one kind of toughness—in this instance the strength of injection molded bars as determined by tensile-impact testing—to density (3). The scatter of the points shows that this important end-use property is not defined by density. Even if the different melt indices of the resins located on this chart (Fig. 10) are taken into account, it is impossible to pick out a clear trend, either upward or downward. Obviously something more than density and melt index is needed.

It is becoming increasingly clear that the most useful third basic resin characteristic for defining olefin polymers is molecular weight distribution. Figure 11, p. 130, shows in an idealized way how this property is manifested (5, 6). On a basis of varying only one resin characteristic at a time, decreasing density increases toughness, decreasing melt index increases toughness, and decreasing breadth of molecular weight distribution increases toughness. These variables are inter-related in such a way, however, that all three must be manipulated to achieve the best compromise value of toughness and other desired use properties.

Finally, then, the means are at hand for looking at polyolefins on a three-dimensional map (Fig. 12, p. 130). In effect, this is the map of commercial polyethylenes (7) in terms of density and melt index, shown before as Fig. 8, now drawn so as to appear to lie down on a horizontal plane with a new third dimension, molecular weight distribution, measured in terms of the ratio of weight-average to number-average molecular weight, illustrated by the height of the vertical columns. Each of the groups of commercial resins represented on this three-dimensional map is located where it is because the density, melt index, and molecular weight distribution characteristic of that location results in physical properties that give the group of resins market value in the corresponding sector of the polyolefin business. For example, the region occupied by the film resins

Fig. 9: Dependence of toughness of polyethylenes on density is not clear-cut

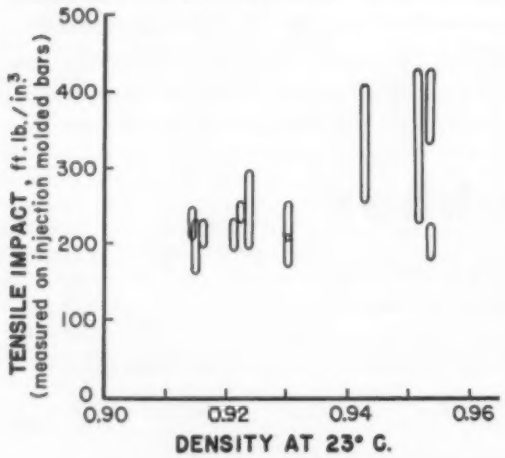
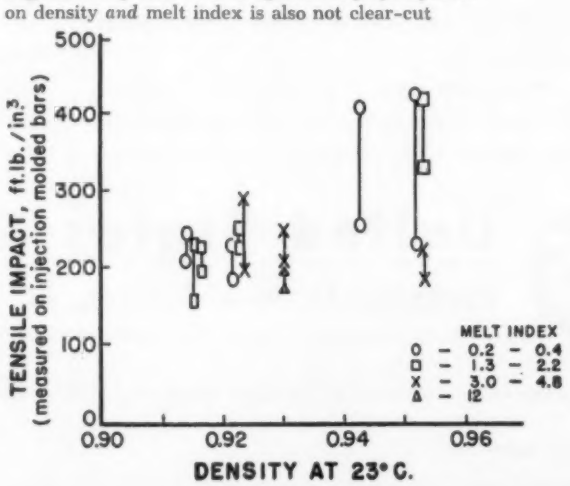


Fig. 10: Dependence of toughness of polyethylenes on density *and* melt index is also not clear-cut



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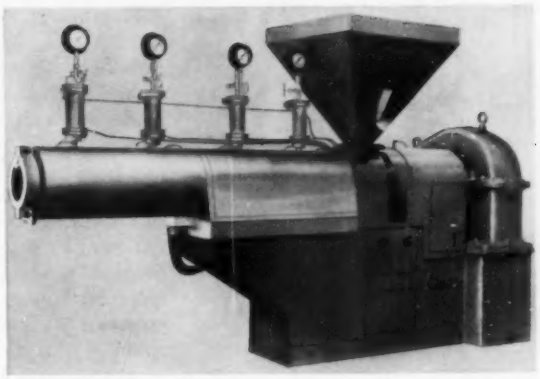
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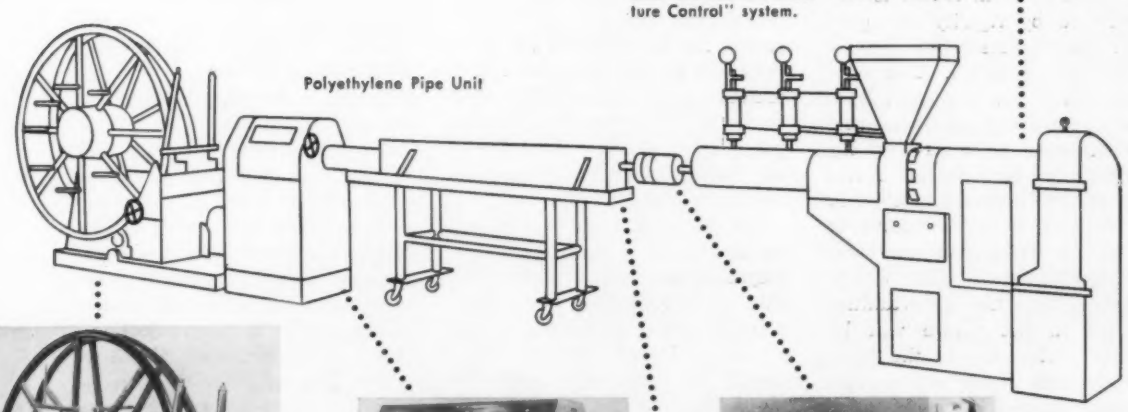
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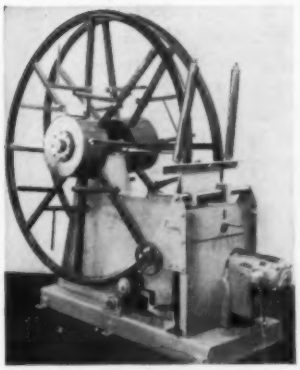
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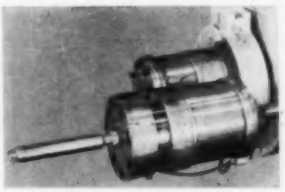
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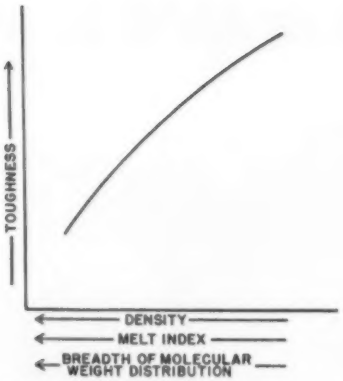


Fig. 11: Dependence of toughness of polyethylenes on density, melt index, and molecular weight distribution (idealized curve)

is outstanding for the toughness and flexibility of the films that are produced from the resins. The molding-resin region is distinguished by rigidity and good flow. The pipe resins are characterized by strength. The wire insulation region corresponds to good processing characteristics and resistance to stress-cracking.

Since the high-density resins have not yet settled into place in the market, it is premature to attempt to put an end-use label on those regions. It seems likely, however, that the opportunities realized in the future will be largely attributable to the location the new resins will occupy on this three-dimensional map. That is, they will owe their commercial success to their characteristic density, their molecular weight distribution, and melt index. Moreover, the commercial "linear" regions will almost certainly be greatly extended, in the reach for optimum property combinations, by developments now in the research laboratories of industry.

This brings up the problem of putting into perspective the new resins—copolymers and polymers of higher olefins—that have been made available by low-pressure polymerization techniques. This can be done so far only in a preliminary way, because these are still under development and are not completely defined as to significant properties. First, it is helpful to note that ethylene copolymers containing minor amounts of higher olefins, such as propylene and butene-1, can be logically handled by reference to the effect of higher olefin content upon density (3, 8), as shown in Fig. 13, p. 133. Although it appears necessary to use different curves for the different comonomers, the relationships seem systematic and this should take care of fitting the copolymers into the polyethylene framework so far as all density-dependent properties are concerned.

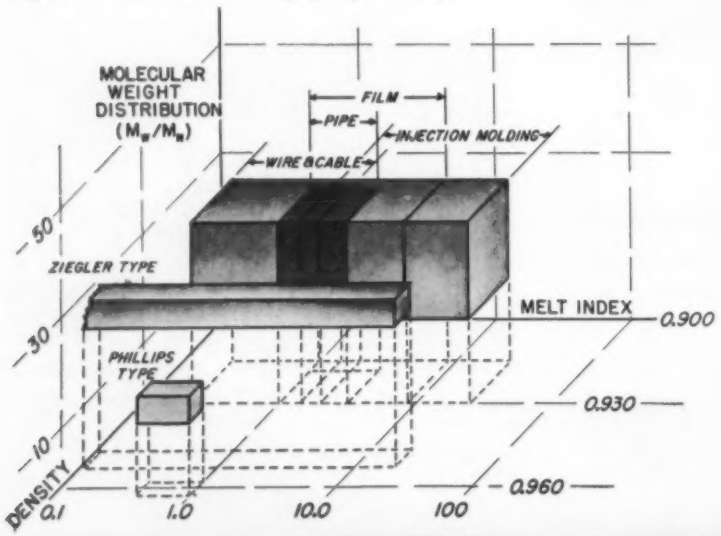
For homopolymers of higher olefins and for certain special copolymers, however, this relationship is not usable. Crystalline polypropylene, for example, has a much higher density than would be predicted from its methyl content and also has a far higher stiffness than would be predicted from its density; see Fig. 14, p. 133 (2, 4, 9, 10). In other words, the correlation previously exhibited (Fig. 4), which was suitable for the full range of polyethylene, breaks down when the newer polyolefins are brought into consideration. This is not serious since density was never a property of commercial value in itself but only a convenient index to the crystallinity-dependent properties that give value.

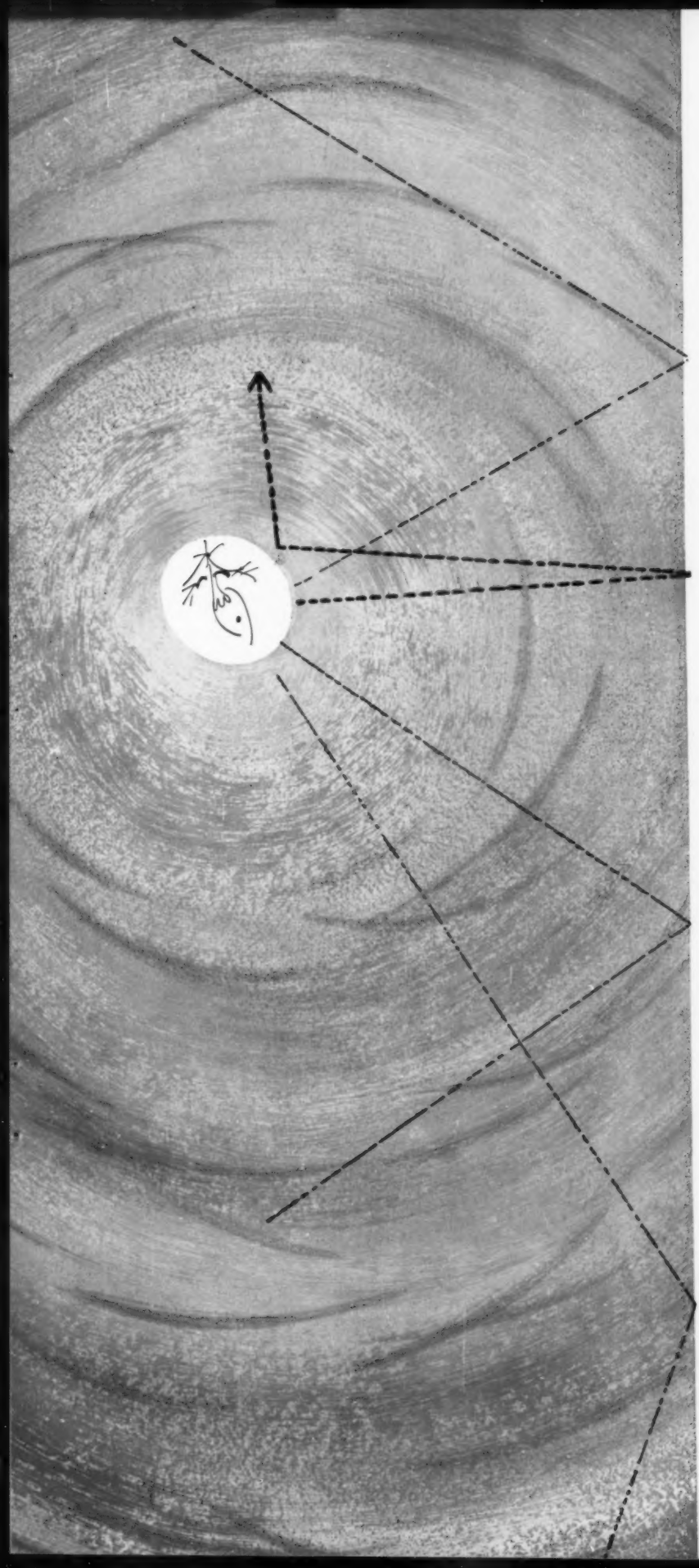
The property of stiffness is a leader in this group in determining market value throughout many sectors of the business, such as rigid containers, appliance housings, and mechanical parts. Stiffness will also serve reasonably well as an index to other crystallinity - dependent properties, at least for some parts of the polyolefin range. This is shown in Fig. 15, p. 133, in which temperature resistance expressed as Vicat temperature is plotted against stiffness (1). The ethylene copolymers with higher olefins fall reasonably well into the relationship set by regular and rigid polyethylenes.

Taking the best available course, stiffness may be substituted for density as a map coordinate for the full polyolefin range. When taken in combination with flow, this gives the map of Fig. 16, p. 133. Here the areas representing the regular polyethylenes designed for the wire-coating, pipe, film, and injection-molding markets and the two types of commercial rigid polyethylene taken from Fig. 8 are relocated with respect to the stiffness scale instead of the density scale. It is now apparent that the ethylene copolymers with the higher olefins fill in the gap between regular and rigid polyethylenes with perhaps some overlap of each, that highly crystalline polypropylene may overlap some portion of the rigid polyethylene area, and that polypropylene of lower crystallinity lands in a region previously known only in the properties of very low-density polyethylenes.

To go farther than this in visualizing the usefulness of these materials requires information that is not available. By the argument advanced above, value that may result from particular locations on this map cannot be settled until there is available some knowledge of molecular

Fig. 12: Three-dimensional polyethylene map





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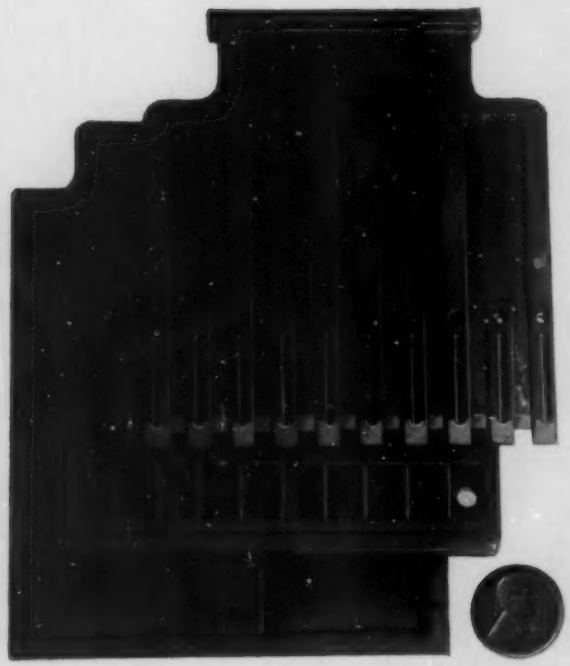
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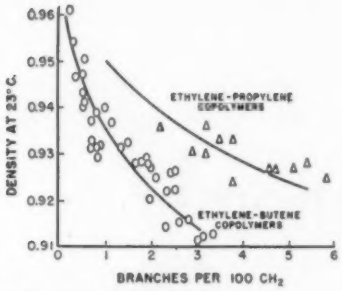


Fig. 13: Dependence of density of ethylene polymers on branch frequency

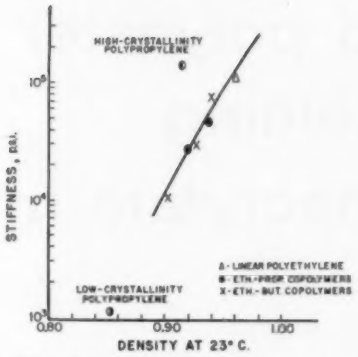


Fig. 14: Relationship of stiffness and density for a wide range of polyolefins

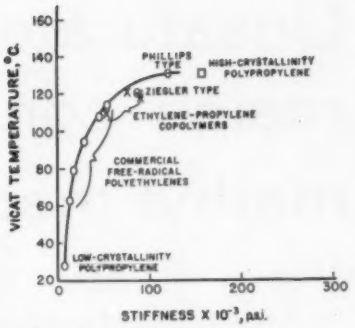


Fig. 15: Relationship of temperature resistance and stiffness for a wide range of polyolefins

weight distribution or an equivalent third parameter. The current activity in technical development of these resins suggests that not many years may elapse before these can be fitted more securely into the three-dimensional framework and thereby into the commercial picture.

Finally, the subject includes homopolymers of olefins higher than propylene. For these, data are too scanty to produce a useful map; about the best that can be done (Fig. 17) is to show the relationship of polymer melting point to olefin structure (11, 12). The polymers of straight-chain alpha-olefins with six, seven, and eight carbon atoms are described as rubbery and so can be dismissed from consideration of plastics opportunities. The polymers of alpha-olefins with five carbons and twelve carbons or more have melting points in an awkward range, which would appear to limit seriously their usefulness as plastics. There are left the polymers of the two-, three-, and four-carbon olefins, that is, of ethylene, propylene, and possibly butene-1, as plastics candidates. The polymers of branched and cyclic olefins melt at higher temperatures than the polymers of straight-chain olefins of corresponding monomer size; the market value of this difference is, however, not yet apparent. For this group of polymers, as well as for other possible polyolefins that have not come to public notice, future developments must be awaited before their place in the polyolefin domain can be confidently known.

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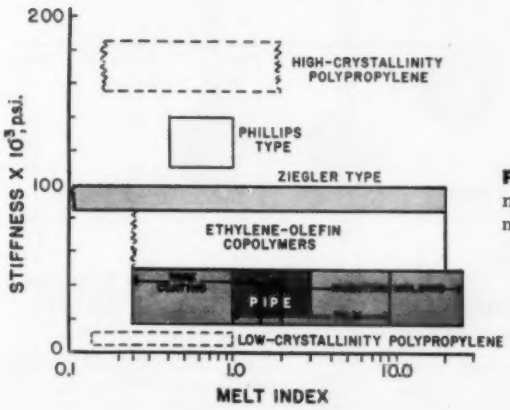


Fig. 16: Stiffness-versus-flow map of polyolefins

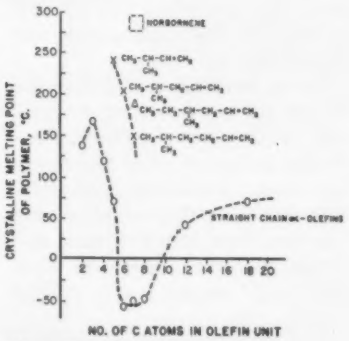


Fig. 17: Crystalline melting points of several higher olefin polymers

Unsaturated polyester resins containing methyl methacrylate monomer

By Arthur L. Smith and John R. Lowry**

Since the introduction of unsaturated polyesters in the early 1940's styrene has been the chief monomer used as the solvent/coreactant. The functions of the monomer in unsaturated polyesters are two-fold: 1) to act as a solvent for the unsaturated polyesters which are extremely high in viscosity and frequently solid; 2) to copolymerize with the unsaturation in the linear polyester chain to yield a cured thermoset plastic.

Styrene monomer fulfills these requirements admirably. It is a good solvent with fairly high boiling point (146° C.) and shows normal aromatic solvent characteristics for most polyesters. It coreacts very rapidly with fumaric(1)[1] unsaturation in a polyester to give fast cure. Furthermore, the price of styrene is among the lowest of the usable monomers. It is only natural, therefore, that styrene has dominated other monomers for use in this rapidly growing field. During this period of fast natural growth, these resins have found use in many divergent types of applications ranging from buttons to boats and including coil potting, corrugated sheet, fishing rods, and automotive parts.

In the initial period of this type of fast growth in widely diversified fields, the possibilities afforded by use of other monomers has been somewhat neglected. The reason for this is that styrene has been best suited in most applications. Other monomers, such as vinyl acetate and diallyl phthalate, used to some extent in early resins, have either disappeared from use or have reached an equilibrium point at relatively low volume of usage. Low volatility of diallyl phthalate renders it usable in some fields of application. Special effects resulting from use of other monomers have been found of relatively minor importance.

More recent work has shown that triallyl cyanurate(2) is useful where high temperature resistance is needed. Vinyltoluene has also found some utility closely paralleling styrene in its behavior but to date not enjoying its popularity.

The special characteristics of the acrylic family of monomers have been largely neglected to date. Work in our laboratories starting in 1948 explored the characteristics afforded by copolymerization of acrylic monomers with polyesters. Early experimental work in both flexible and rigid polyester systems revealed that copolymerization with fumaric unsaturation was sluggish. Resulting copolymers were frequently inferior in physical properties. Experimental evidence of the poor copolymerization of methyl methacrylate with polyesters is shown in Table I, below.

In addition to the poorer physical properties of resin B as compared to resin A, the reactivity data indicate lower degree of coreaction. The lower exothermic peak, together with longer gel time and propagation time, shows that a greater portion of homopolymer is formed with corresponding lower degree of crosslinking. This is demonstrated more forcibly by the brittleness noted in the cured reactivity test specimens.

However, in the case of resin D, in which styrene is used in conjunction with methyl methacrylate, strength properties are considerably improved over those of resin B. In this case, the styrene provides the link between the unsaturated polyester and the methyl methacrylate, since sty-

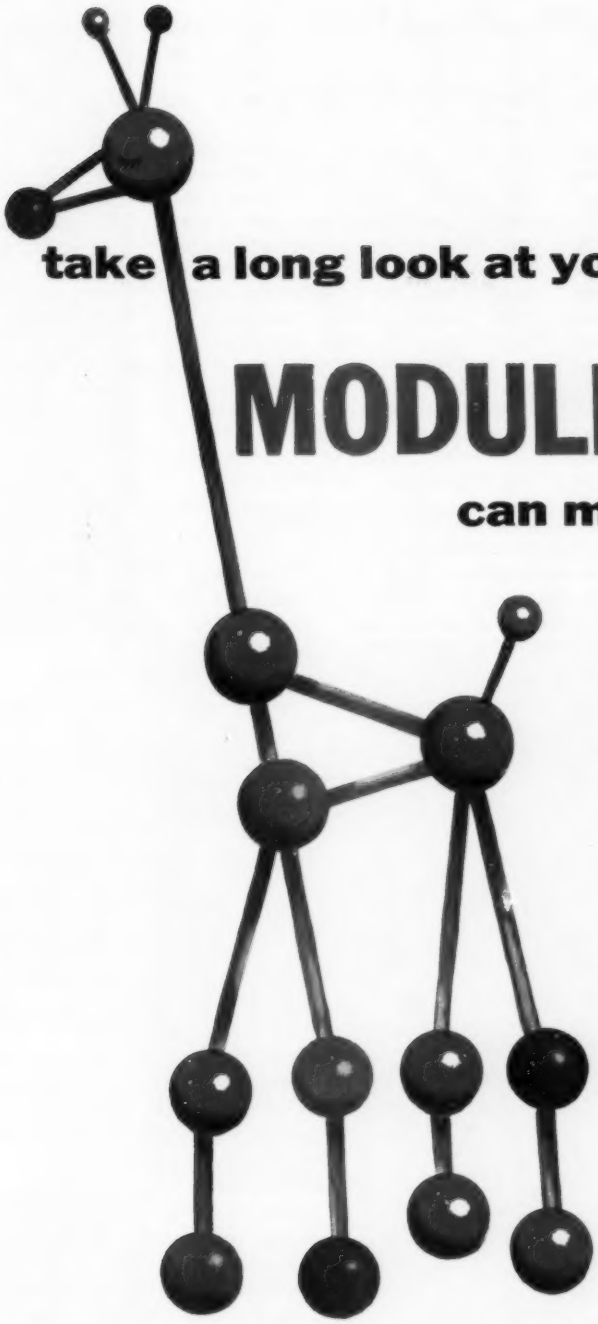
Table I: Properties of polyester/styrene/methyl methacrylate resins

	Resin A	*Resin B*	*Resin C*	*Resin D*
Polyester, %	75	75	60	60
Styrene, %	25	—	40	20
Methyl methacrylate, %	—	25	—	20
Reactivity (1% benzoyl peroxide gel time), min.	1.8	3.3	1.6	2.5
Propagation time, min.	1.5	2.2	3.0	1.8
Time to peak temp., min.	3.3	5.5	4.6	4.3
Exothermic temp., °F.	361	294	381	389
Properties of cured polymer				
ASTM heat distortion temp. (264 p.s.i.), °C.	85	50	91	76
Flexural strength, p.s.i.	16,000	9,100	15,000	14,000

* Rohm & Haas Co.

Presented at a symposium on "New developments in alkyd and other polyesters" at the Miami meeting of the American Chemical Society, April 1957.

[1] Numbers in parentheses link to references at end of article, p. 200.



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Table II: Solarization tests in Bristol of glass-reinforced plastics

Series No.[a]	Exposure period	Composition, Polyester/MMA/styrene	Gloss			Color[b],(A-B)/G			Fiber pop-out
			Orig.	Exposed	Retention	Orig.	Exposed	Change	
	yr.				%				
1760A	3	75/25/0	55	30	54.5[c]	0.063	0.215	0.152	Very bad
B		75/0/25	71	59	83.0	.120	.219	.099	Bad
C		60/20/20	75	62	82.6	.065	.249	.184	Slight
D		60/10/30	80	50	62.5	.093	.195	.102	Some
E		60/0/40	64	50	78.1	.140	.349	.209	Bad
1585H-1	1	P-444/styrene	44	41	93.1	.143	.216	.073	Very slight
J-1		Resin A/styrene	58	41	70.6	.119	.237	.118	Some
K-1		Resin B/styrene	59	50	84.7	.148	.397	.249	Some
L-1		Resin C/styrene	65	53	81.5	.171	.276	.105	Slight
1962A	2	P-444/styrene	57	47	82.4	.109	.183	.072	Very slight
B		Ditto + improved stab.[d]	50	39	78.4	.162	.159	−.003	Very slight
E		Resin A/styrene	65	45	69.2	.116	.268	.152	Some
F		Resin D/styrene	58	9	15.5	.153	.382	.229	Some to bad; dull

[a] 1760 Series used clear resin; all others were white translucent.
[b] Code for color formula (4):
A = Photovolt reading with amber filter.
B = Photovolt reading with blue filter.
G = Photovolt reading with green filter.
[c] Surface contains many small cracks.
[d] Improved ultra-violet stabilizer.

rene copolymerizes readily with both fumaric unsaturation and with methyl methacrylate(3).

Experimental procedures

Tests of physical properties were run on ¼-in. cast sheet cured with 1% benzoyl peroxide for 6 hr. at 60° C., 1 hr. at 80° C., 1 hr. at 100° C., plus 2 hr. at 120° C. Castsheet of ⅛ in. thickness cured on the same schedule was used for ultra-violet light resistance and weathering tests. However, most testing of ultra-violet light resistance and solarization (outdoor weathering) was run on glass fiber reinforced sheets. These were prepared using 25% glass fiber in the form of Owens-Corning #216 soluble polyester-bound glass-fiber mat. The resin was diluted with monomer to about 200-cp. viscosity and was catalyzed with either 0.5% benzoyl peroxide or with 1% cumene hydro-peroxide plus 0.2% benzoyl peroxide. The glass mat was saturated with the resin by usual hand lay-up techniques and cured between 600 PT cellophane. This cellophane-sheathed lay-up was then placed between ¼-in. plate glass and cured in an air-circulating oven for 2 hr. at 180° F. The purpose of the plate glass was two-fold: 1) to insure a flat specimen and surface for ease of making instrumental readings of gloss and color, and 2) to simulate the conditions of heating encountered by a commercially made corrugated sheet in the center of a stack of four to six panels. Tests were run on both clear resin and on resin made white translucent with 0.05% TiO_2 to accentuate the yellowing and to simulate commercial white translucent corrugated sheet.

Fadeometer exposure was used in early work as an accelerated test, but was discarded in favor of Weatherometer operating under standard A.S.T.M. D 822-46T conditions. De-ionized water was used for the spray, which operated 18 min. out of every 2-hr. period. Visual observations were made of results. In addition, gloss retention was measured by 60 degree Photo Volt meter reading (A.S.T.M. D 523-53T). Degree of yellowing was measured according to Federal Specification Test Method(4) and found to correlate well with visual appearance.

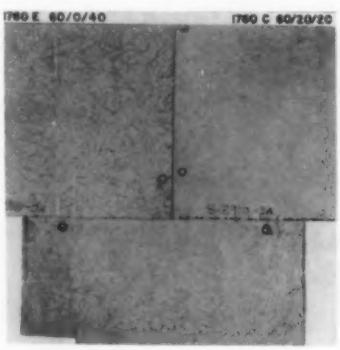


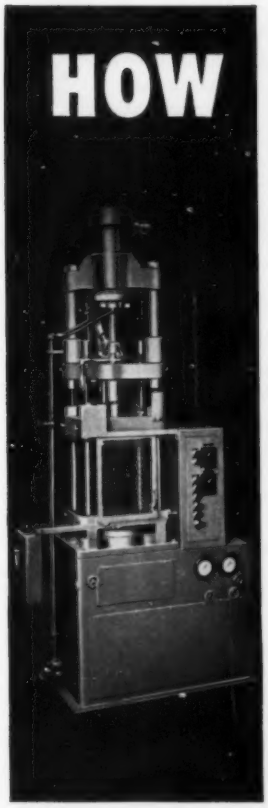
Fig. 1: Appearance of 1760 series glass-reinforced panels after three years' exposure in Bristol. Composition: polyester/methyl methacrylate/styrene. (See Table II, above)

Gloss meter readings on cast resin gave reliable data showing low variability. Because of the slightly uneven surface caused by glass fibers, reinforced specimens gave greater variability. In most cases, however, the changes due to the test conditions (Weatherometer or solarization) were far greater than variation due to unevenness of surface.

Photographs were taken of glass-reinforced sheet against a white translucent backlighted Plexiglas sheet. This method of photographing best illustrates the fiber pop-out which is so apparent on visual examination.

Erosion resistance

Unsaturated polyesters were first used in glass-reinforced corrugated sheet in the late 1940's. Because of frequent use in outdoor installations, it is obvious



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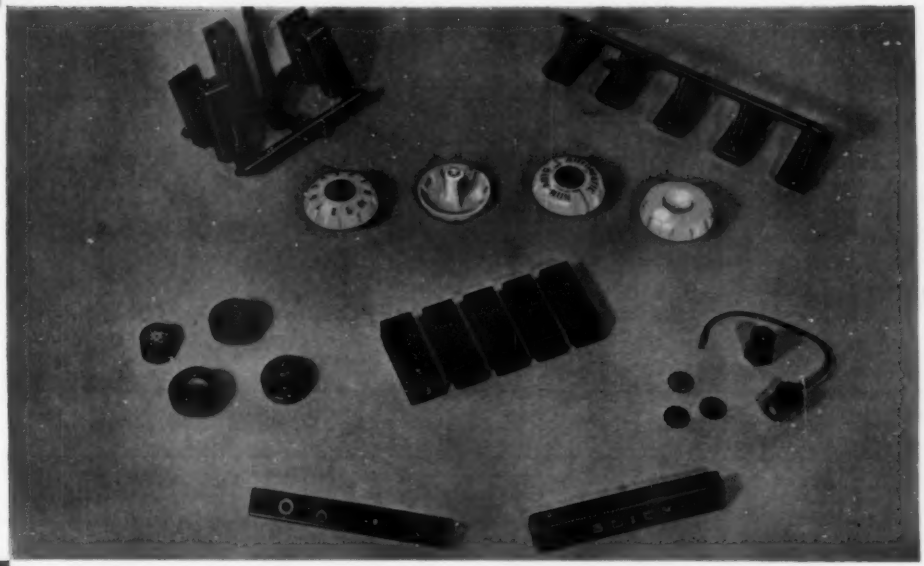
The vertical method of injection molding offers many production-boosting benefits in turning out parts requiring loose cores and inserts. Loading trays are quickly positioned, and there's no need for elaborate holding devices . . . thanks to the horizontal moving platen. Other advantages: Less chance of mold damage; minimum floor space needed; assured stability of inserts during mold closing; convenient, comfortable working conditions for operator.

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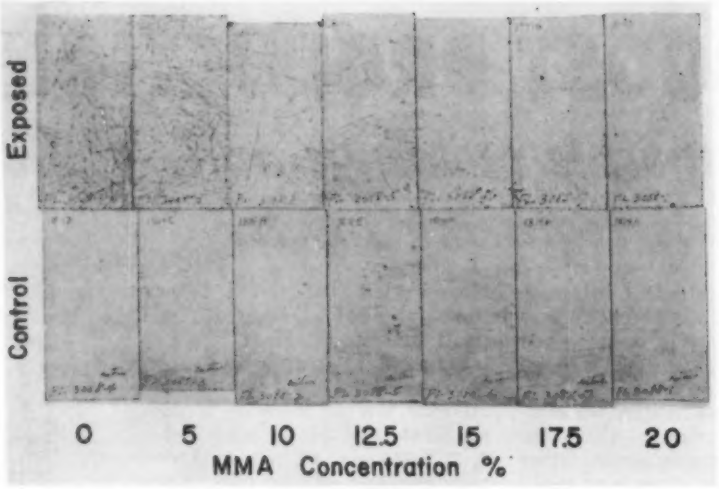


Fig. 2: Appearance after 24 months' exposure in Florida of glass-reinforced panels made with polyester/styrene resin containing various amounts of methyl methacrylate

that resins for use in this field require excellent durability, but polyester resins offered at that time were not designed for this type service. Consequently, early products showed serious deficiencies, such as rapid discoloration or yellowing and complete surface erosion, after about a year of exposure. This erosion was evidenced by appearance of glass fibers on the surface of the panels, which is called "fiber pop-outs."

To minimize the fault of discoloration, ultra-violet light stabilizers were introduced into polyester resins offered just prior to 1950. There has been continued improvement in the type of stabilizers as well as improvement in polyester formulation since that time. These efforts, however, were concentrated on prevention of discoloration.

Little has been done to correct the erosion of these resins on long term exposure. Exposure history on cast resins, however, frequently showed little degradation of cast, non-reinforced resins. A brief study by the authors of factors influencing these observed differences in performance, such as cure schedule, catalyst, polyester/styrene ratio, and polyester composition, revealed that one of the most significant factors was the styrene content of the resin. It is well recognized that polystyrene is not suitable for exterior exposure. Therefore, in a copolymer system where there is sufficient styrene to form a styrene-to-styrene bond, it is not surprising that it, too, would suffer on outdoor exposure.

It was only natural, therefore, that methyl methacrylate, long recognized for its superior durability characteristics, should be tried for this application. In Series 1760 of Table II, p. 136, the results of early experimental work on the effect of methyl methacrylate as a monomer in unsaturated polyesters is presented. A study of these data, together with Fig. 1, p. 136, reveals that when methyl methacrylate is used as the sole monomer, very poor results are obtained, indicating the necessity of using both methyl methacrylate *and* styrene for optimum results. Results of experiments covering the effect of replacing styrene with methyl methacrylate in the resin composition are given in Fig. 2, left. Methyl methacrylate was substituted for styrene in a 60% polyester/40% styrene composition at the indicated concentrations of 5, 10, 12.5, 15, 17.5, and 20% of the total composition, yielding a maximum concentration of methyl methacrylate at 60% polyester, 20% methyl methacrylate, and 20% styrene. The photograph was taken of the

Table III: Weatherometer tests of white translucent glass-reinforced panels

Series No.	Composition	Gloss			Color, (A-B)/G		
		Original reading	1000 hr. reading	Retention after 1000 hr.	Original	1000 hr.	Change
				%			
1585H-1	P-444/styrene	44	30	68.1	0.143	0.343	0.200
J-1	Resin A/styrene	58	10	17.2	.119	.527	.408
K-1	Resin B/styrene	59	11	18.6	.148	.612	.464
L-1	Resin C/styrene	65	6	9.2	.171	.491	.320
1962A	P-444/styrene	57	20	35.1	.109	.376	.267
B	Ditto + improved stab.	50	16	32.0	.162	.316	.154
E	Resin A/styrene	65	10	15.3	.116	.531	.415
F	Resin D/styrene	58	8	13.7	.153	.570	.417
1878D	P-444/styrene	65	33	50.7	.155	.356	.201
H	P-444/vinyltoluene	54	6	11.1	.178	.367	.189
J	Resin A/styrene	69	34	49.2	.200	.479	.279

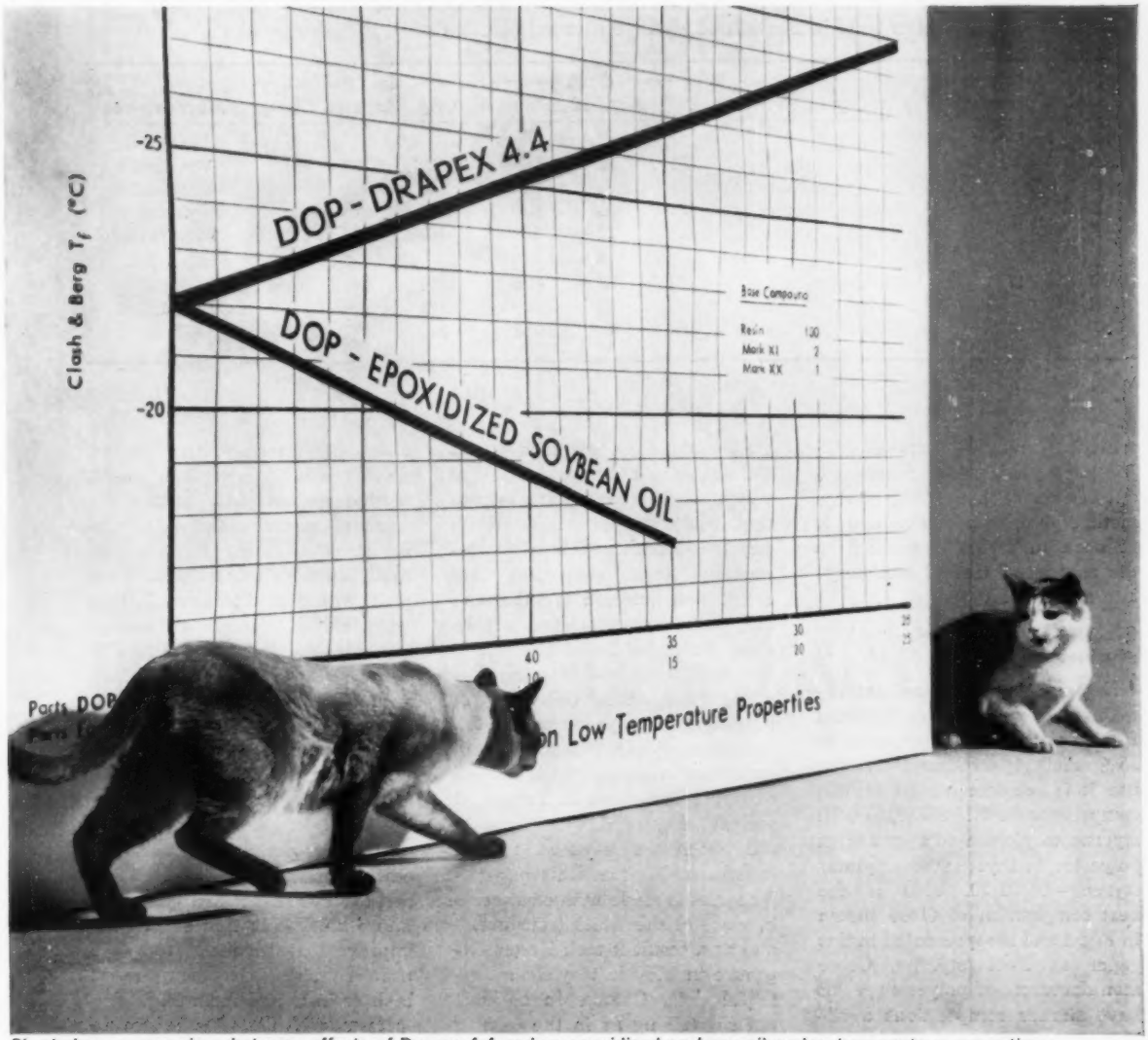


Chart shows comparison between effects of Drapex 4.4 and an epoxidized soybean oil on low temperature properties. Low temperature flexibility is a major advantage of Drapex 4.4.

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Table IV: Solarization tests in Florida of glass-reinforced plastics

Series No.	Exposure period	Composition	Gloss			Color,(A-B)/G			Fiber pop-out
			Orig.	Exposed	Retention	Orig.	Exposed	Change	
	mo.				%				
1962A	12	P-444/styrene	51	52	102	0.170	0.192	0.022	Very slight
B		Ditto + improved stabilizer	57	50	88	.173	.176	.003	Very slight
E		Resin A/styrene	59	38	64	.115	.378	.263	Some
F		Resin D/styrene	77	12	16	.157	.436	.279	Some to bad
1878D	17	P-444/styrene	65	53	81.5	.155	.207	.052	Slight
H		P-444/vinyltoluene	54	13	24.0	.178	.264	.086	Bad; dulled
J		Resin A/styrene	69	42	60.9	.200	.347	.147	Bad

controls (unexposed) and the exposed panels. Serious fiber pop-out is evident in the "0% methyl methacrylate" specimen and is reduced in direct proportion to the amount of methyl methacrylate substituted.

Properties of P-444/ styrene resin

Extensive work was undertaken on a composition Paraplex P-444, which is 75% polyester in 25% methyl methacrylate. For use it is recommended that this composition be diluted 80/20 with styrene to yield a composition of polyester/methyl methacrylate/ styrene—60/20/20. This is the best composition of those shown in Fig. 2 and is represented in this paper as P-444/styrene. Other manufacturers of polyester resins have similar compositions available.

Results of Weatherometer tests are given in Table III, p. 138; Series 1585 compares P-444 to other commercially available resins made for use in corrugated sheet. Results of the same series exposed at Bristol, Pa. for 12 months are given in Table II. These data show the superiority of P-444 to the other commercially available resins in both gloss retention and in non-yellowing (see Table III).

Series 1962 compares P-444 to two other commercial resins on Weatherometer tests of 1000 hr. (Table III), solarization at Bristol for two years (Table II), and at Florida for one year (Table IV). All data show the superiority of P-444 in gloss and color retention. Included in this experiment was the use of an improved ultra-violet light stabilizer which yielded even better resistance to yellowing. It is interesting to note that results are consistent at both exposure locations and in Weatherometer tests, suggesting that correlation between Weatherometer and actual exposure is possible. An exposure of 1000 hr. in the Weatherometer is more rigorous than either one year in Florida or two years in Bristol.

Data on Series No. 1878 tested on Weatherometer and Florida exposure are given in Tables III and IV. Figure 3 is a photo of the specimens exposed for 17 months in Florida. This particular series is made with clear resin in place of the white translucent, and as a result it took longer exposure in Florida to yield meaningful data. Change in color is not so striking as in the case of the white translucent panels. All data show the superior gloss and color retention of P-444, poorer performance of vinyltoluene.

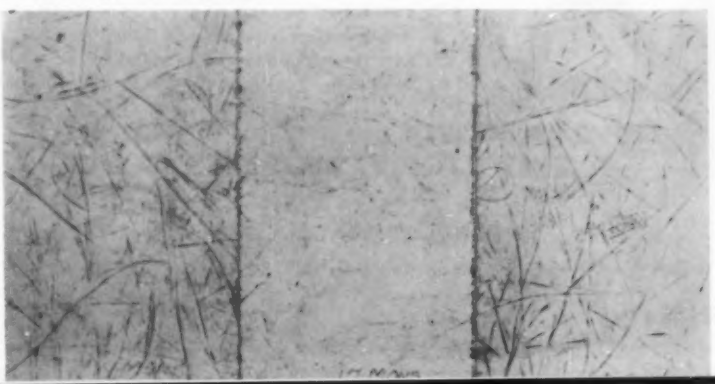
Use of MMA with commercial resins

In the interest of showing the effect of the use of methyl methacrylate (MMA) with commercial polyester/styrene resins, work was undertaken with methyl methacrylate as the diluent of several commercial resins in place of the styrene normally used for this purpose. Each resin was diluted to about 200 cp. with either styrene or methyl methacrylate as indicated in Table V, p. 142. Data on gloss and yellowing are given for both cast white translucent resin as well as glass-reinforced white translucent panels exposed for 1000 hr. in the Weatherometer. The better uniformity of gloss meter readings on the cast samples suggests that cast resins supply a more reliable method for experimental work. These data show that substantial improvement resulted from the use of methyl methacrylate in both resin C and resin D.

Results of two-year exposure in Florida are given in Table VI, p. 142. In this set, glass-reinforced panels based on clear, unpigmented, conventional styrene-based polyester resins are badly yellowed and completely dull on the exposed face. Methyl methacrylate modified resin (P-444), however, remains unaffected.

Close study of the exposed

Fig. 3: Appearance of 1878 series glass-reinforced panels after 17 months' exposure in Florida



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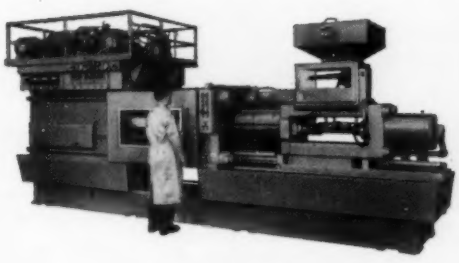
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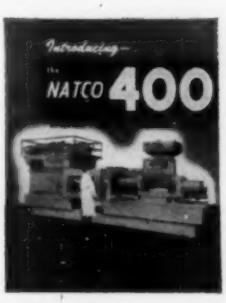
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Table V: Weatherometer tests of white translucent plastics

Series No.	Composition	Gloss: Original reading	Gloss: 1000 hr. reading	Gloss: Retention	Color, (A-B)/G: Original	Color, (A-B)/G: 1000 hr.	Color, (A-B)/G: Change
	Castings:			%			
2114A	P-444/styrene	95	38	40	0.068	0.300	0.232
B	Resin A/styrene	96	5	5	0.078	0.433	0.355
E	Resin C/styrene	97	7	7	0.181	0.449	0.268
F	Resin C/MMA	96	34	35	0.213	0.376	0.159
G	Resin D/styrene	99	3	3	0.057	0.436	0.369
H	Resin D/MMA	96	35	36	0.072	0.318	0.246
	Glass reinforced:						
2114A	P-444/styrene	42	20	48	0.125	0.298	0.173
B	Resin A/styrene	52	7	13	0.100	0.396	0.296
E	Resin C/styrene	48	9	19	0.169	0.488	0.319
F	Resin C/MMA	53	24	45	0.229	0.382	0.153
G	Resin D/styrene	52	16	30	0.098	0.433	0.335
H	Resin D/MMA	52	29	55	0.116	0.333	0.217

Table VI: Gloss of glass-reinforced panels exposed two years in Florida

Composition	Gloss meter readings: Original	Gloss meter readings: Exposed
Resin A/ styrene	70	2.5
P-444/ styrene	67	58
Resin D/ styrene	62	1.5

surface shows microscopic crazing of the dull surface of resins A and D, while the P-444 remains non-crazed and in as perfect condition as when exposed. Figure 4 shows photomicrographs taken of the exposed panels (magnification is 60X at 2½ in. diameter, about 35X in Fig. 4).

Effects of methyl methacrylate

What besides durability has changed with the use of methyl methacrylate?

1) Most noticeable is transparency. Because of the difference in refractive index of polymerized styrene (1.59) and methyl methacrylate (1.492), the transparency of glass-reinforced panels varies with the ratio used. Depending on the base polyester, use of methyl methacrylate in place of styrene may improve or detract from transparency.

2) Rate of curing has been found to be as fast as the comparable resins using styrene. Supporting data on reactivity were given in Table I, p. 134.

3) Strength properties of the methyl methacrylate modified resin are also similar (see Table I). When combined with glass fibers, strength properties are equivalent, if not superior, to their styrene counterparts.

4) Use conditions. In general, methyl methacrylate - modified resins may be handled similarly to their styrene counterparts. It has been found that air is more soluble in methyl methacrylate-modified resins and this has led to the need for special handling in some cases. This subject has been dealt with by the authors in a previous paper(5).

Conclusions

Experimental evidence based on accelerated tests as well as actual outdoor exposure has

(*To page* 200)

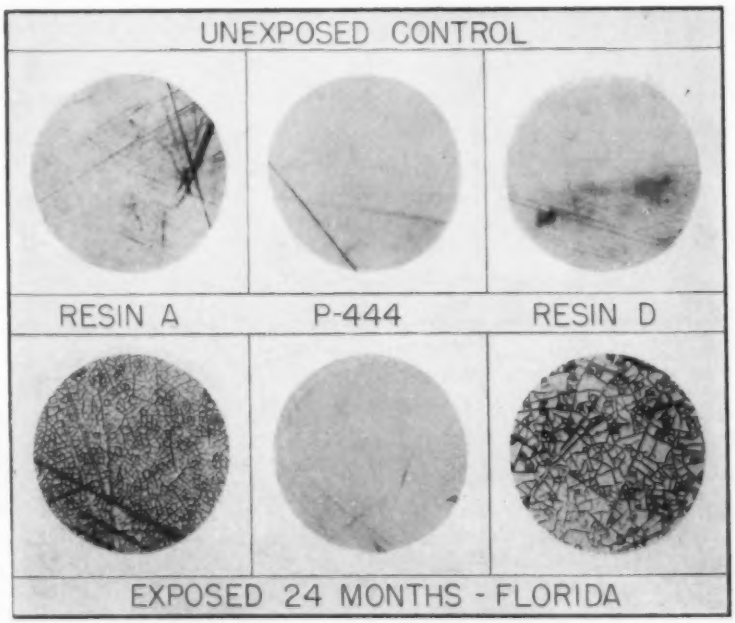


Fig. 4: Photomicrographs of surfaces of glass-reinforced panels after two years' exposure in Florida; resins *A* and *D* are crazed

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Plastics Digest

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. For complete articles, send requests direct to publishers. List of addresses is at the end of Plastics Digest.

Materials

Polypropylene makes a 3-nation debut. Chem. Week *81*, 31-2 (Dec. 7, 1957). Production statistics for polypropylene are presented.

Bombshell drops in polyethylene. Chem. Eng. News *35*, 17-18 (Dec. 30, 1957). The composition of matter patent issued to Du Pont on linear polyethylene is discussed.

Polyethylene family grows. Chem. Eng. News *35*, 52 (Dec. 2, 1957). A new polyethylene that behaves like a moderate-to-high melting wax is described.

Cast urethane rubber. R. H. Kittner and K. A. Pigott. Prod. Eng. *28*, 68-71 (Sept. 16, 1957). The properties, performance, and design applications of urethane rubbers are discussed. The material has a wide range of hardness, from 60 to 96 on the Shore A durometer scale, together with elongations from 600 to 800 percent. Other mechanical properties are compared with GR-S, neoprene, and natural rubber. The urethane rubbers have good solvent resistance for a rubber and very low water absorption. Service temperature limitations are given. The general aspects of factors that are pertinent to design applications, such as machining tolerances, compression load factors, and composite castings, are also discussed.

Direct-bonded copper-clad Teflon high-temperature laminate. D. E. McElroy and S. J. Stein. Elec. Manuf. *60*, 126-28 (Oct. 1957). The properties of a printed wiring board, designed for operation at 200° C. and fabricated by bonding copper foil directly to Teflon 100X, without any adhesive interlayer, are described. The power factor and dielectric constant values of the laminate agree with those published for Teflon 100X, indicating no impairment of the electrical properties by lamination. Surface resistivity values were found to be excellent. Methods of providing rigidity to the laminate by additional backing materials are discussed.

Designing with Teflon. Machine Design *29*, 86-95 (Sept. 5); 162-67 (Sept. 19); 124-31 (Oct. 3); and 124-30 (Oct. 17, 1957). The properties, design, and uses of tetrafluoroethylene plastics parts are reviewed; 41 figures and 24 tables are included. Part 1 describes how properties are affected by processing: thermal and chemical resistance, nonadhesiveness, and excellent electrical properties are inherent in the chemical structure of tetrafluoroethylene plastics and are independent of fabrication methods; stiffness, flex life, permeability, tensile properties, etc., can be altered by the fabricator. In Part 2 the strength and time-dependent properties of Teflon are described. Engineering design data are presented and creep and stress relaxation are discussed. Methods and designs for eliminating or overcoming undesirable time-dependent properties are presented. Part 3 is an extensive exposition of thermal, chemical, wear, and electrical properties.

Engineering aspects of polymer processes. A symposium. Ind. Eng. Chem. *49*, 1796-1862 (Nov. 1957). The engineering aspects of the processes used in the manufacture of polymers are discussed in a group of fourteen papers. The topics considered include emulsion polymerization, continuous recycle copolymerization, silicone fluid manufacture, polyelectrolytes, sulfonation, dewatering by syneresis, separation of miscible liquids, concentrating GR-S latex, curing process in phenolic resin by X-ray diffraction and electron microscopy, degradation of hydrophilic cross-linked resins, mixing of high viscosity Newtonian and non-Newtonian fluids, mixing in laminar-flow systems, and mixing in the single-screw extruder.

New family of heat-resistant urethane polymers revealed. V. V. D'Ancicco. Industrial Lab. *8*, 66-71 (Nov. 1957). Increased heat-resistant urethane polymers are obtained by prereacting the tolylene diisocyanate with a triol before completing the process by reacting with a polyester or a polyether. Triols such as trimethylolpropane, hexanetriol, and hydroxyterminated polyesters containing three or more hydroxyls per molecule may be used. Properties of foams made by these reactions are reported.

Graft copolymers—Part I. S. H. Pinner and V. Wycherley. Plastics (London) *22*, 456-8 (Nov. 1957). An attempt was made to eliminate some of the ambiguities in the nomenclature of normal, block, and graft copolymers. Illustrations of typical examples of each type of copolymer and examples of suggested nomenclature are presented. The proposed scheme was designed as an extension of and intended to fit the nomenclature recommendations of the International Union of Pure and Applied Chemistry on polymeric materials. Several chemical methods of preparing nonrandom copolymers are presented. Methods of reduction or prevention of homopolymerization of the monomer during grafting are discussed. Other methods include the formation of hydrogen peroxide and per-ester groups as grafting sites and techniques for grafting to polymers containing terminal amine groups or active

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hydrogen from hydroxyl or amide groups. Several systems of grafting monomers to rubber polymers are also considered.

Molding and fabricating

How to work with rigid PVC plastic piping. J. P. Kelleher and C. L. Mantell. Chem. Eng. *12*, 300, 302, 304, 308 (Dec. 1957). Most conventional machining operations can be effectively performed on rigid polyvinyl chloride, although a minimum of heat should be generated. The unplasticized material has a high notch sensitivity and deep grooves should be avoided. Pipe cutting can be best accomplished with a hack saw or circular power saw. Threaded joints should not be overtight as such joints will tend to relieve themselves and result in leakage. Directions for obtaining solvent-cemented joints are given. Heat-welding is generally used in the assembly of a piping system only to repair improperly assembled threaded or solvent-cemented joints.

An improved laboratory heat-sealer. K. W. Ninnemann. Modern Packaging *31*, 171-5, 250, 252 (Nov. 1957). A new laboratory heat-sealer, useful for research and control purposes, is claimed to be capable of simulating a wide variety of sealing variables, particularly those encountered in high-speed sealing machines. Sealing temperature, pressure, and dwell time may be varied independently and over wide ranges. The capabilities of the instrument are substantiated with a considerable amount of data obtained on coated cellophane and on polyethylene films. The instrument has, in some cases, brought about improved heat-sealing characteristics in certain types of packaging film.

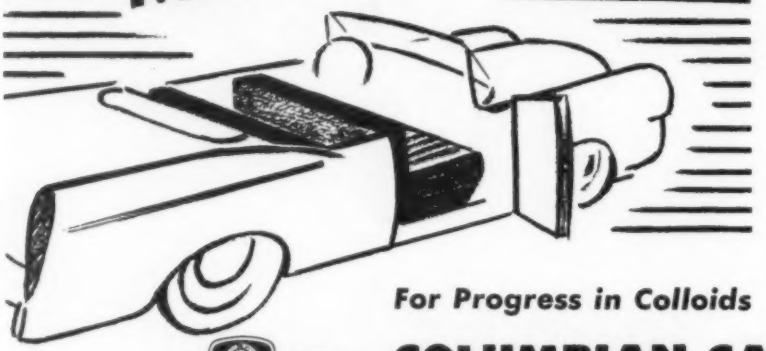
Applications

A new plastic packing for cooling towers. A. L. Fuller, A. L. Kohl, and E. Butcher. Chem. Eng. Progress 53, 501-5 (Oct. 1957). Packings used for cooling towers of the counterflow design are generally classified as either splash or film type. The former consists of grid decks generally spaced from 1 to 2 ft. in the vertical di-


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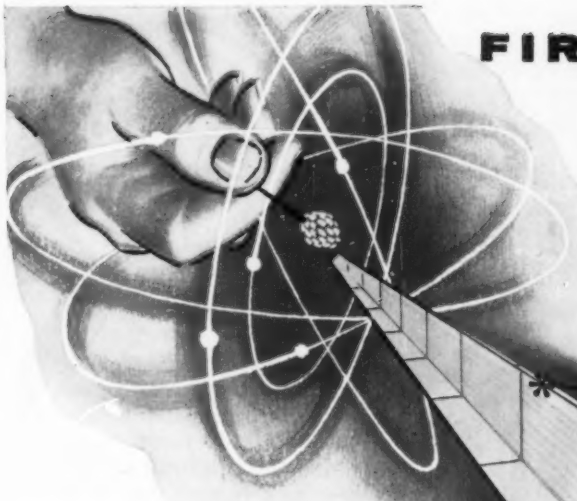
rection. The latter is that type in which the water flows in a relatively continuous film on the wetted surface, with film packings most commonly of the egg-crate design. Plastics were investigated as a substitute for wood in these applications. An injection molded grid packing composed of high-impact polystyrene and linear polyethylene was developed. Ceramic packing, wood splash and wood film packing, high-impact polystyrene formed from sheet, and the newly developed packing are compared.

Diffraction gratings on plastics films and their potential applications. I. Grave Kunststoffe *47*, 113-115 (Mar. 1957). The possibility of introducing interference color effects on plastics is discussed. Diffraction gratings are used as matrices from which grating replicas are made on the surfaces of plastics films by means of thermoplastic deformation. This method is fast, simple, and economical. By means of vacuum metallization any desired brightness can be obtained. The grating replicas have a characteristic color dispersion which can be adjusted by the method and design used in producing the lines in the matrix. Potential applications include advertising items, watch dials, jewelry, and stained windows.

Oxidative degradation of epoxy resin coatings. W. R. R. Park and J. Blount, Jr. Ind. Eng. Chem. *49*, 1897-1902 (Nov. 1957). Acid-cured epoxy films aged in oxygen at 180° C. absorbed oxygen, increased in density, and lost weight. Infra-red studies showed that hydroxyl groups disappear and carbonyl groups appear in the molecular structure during oxidation, and the permeability of these films toward helium decreases as they are oxidized. A theory of film failure stresses the effects of dimensional changes on the loss of good protective coating properties. The most stable epoxy films are thicker than 1 mil, cured at temperatures below 205° C., and formulated to contain the least unreacted epoxide groups when cured.

Research progress in dielectrics—1957. A. E. Javitz. Elec. Manuf. *60*, 94-103 (Dec. 1957). This is a report on the Conference on Electrical Insulation. Papers and round-table discussions are summarized and interpreted and test results are given. The synthesis of heteroatom polymers for heat-resistant properties, the behavior of certain materials after gamma radiation, the mechanisms of electrical breakdown, and the "treeing" in polyethylene cable are among the subjects discussed.

Contact angles between water and some polymeric materials. H. H. G. Jellinek. U. S. Army Corps of Engineers, SIPRE Research Report 36, (Aug. 1957). Measurements were made with 22 more or less hydrophobic polymers and lacquers at intervals of 5 or 10 min. for periods up to 1 hour. All surfaces were carefully cleaned, and some surfaces were baked. Highest initial (time 0)



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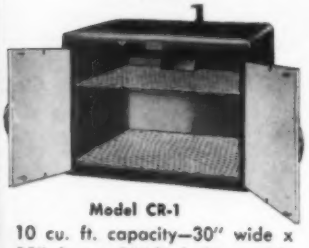
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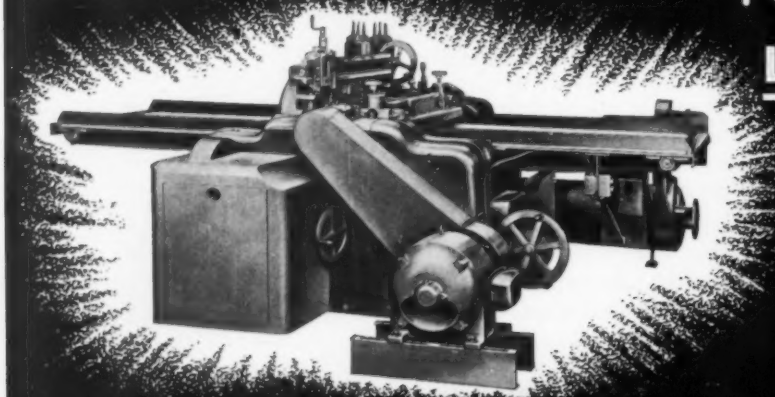
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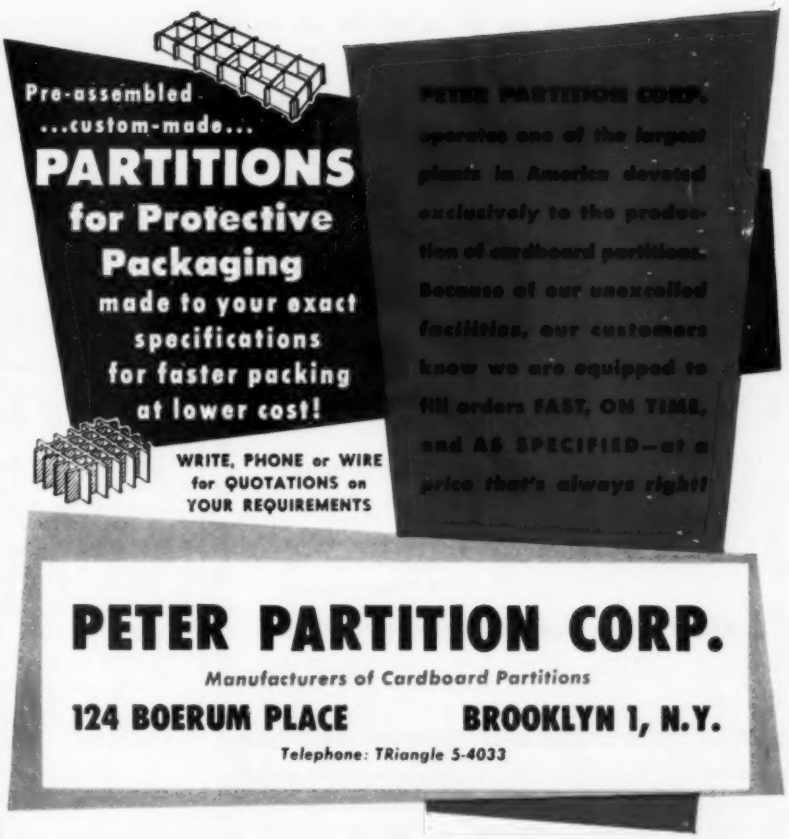
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average contact angles (106 to 106.6°) were measured for Foster Snell rain repellent wax, Barrett 25-218 water repellent varnish (air-dried), and Cardolite NRL-7241. After 40 min. contact angles for these substances were 95.6°, 90.9°, and 91.0°. The measurement apparatus is illustrated, and data are tabulated.

Plastic-faced dies for metal-forming. J. Delmonte. Product Eng. Design Digest, D9 (Mid-Oct. 1957). Epoxy plastics can be adjusted through formula modification or reinforcement to meet particular metal working requirements when used as facings on metal dies. It is also possible to produce accurate reproductions of plaster, wood, and metal patterns or molds without further finishing operations after the part is removed from the mold. Because of rapid setting of plastic facings, it is possible to place the tool in operation within 24 to 48 hours. Plastic-faced tools are highly adaptable to limited production run tooling but they are not a panacea for metal forming. The use of reinforcing materials for increased strength and reduced creep is discussed.

Plastics vie with metals. J. P. Kelleher and C. L. Mantell. Chem. Eng. *11*, 296, 298, 300, 302, 304 (Nov. 1957). Rigid, unplasticized polyvinyl chloride is generally believed to have a good combination of engineering properties for process piping. It is attacked either directly, as by strongly oxidizing chemicals, or by solvation as with ketones. However, such materials are easily handled by inexpensive metallic piping. Polyvinyl chloride is very resistant to salt solutions, nonoxidizing acids, and some oxidizing chemicals. It is self-extinguishing, arresting further propagation of a flame. Although the tensile strength is less than that of most metallics, it compares favorably with other materials of its type. Comparison of mechanical and physical properties of polyvinyl chloride piping with other plastics and with metals indicates its advantages and limitations.

Thermal insulation. C. M. Bosworth. Product Eng. *28*, 97-100



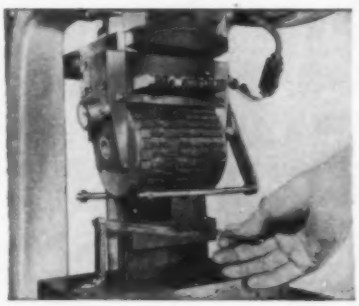


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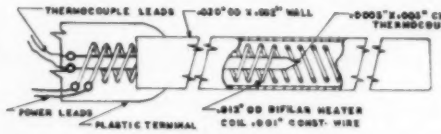
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(Nov. 11, 1957). Thermal insulation materials, mineral, vegetable, and plastic, are listed along with a description of each type, general usage, thermal conductivity, maximum operating temperatures, and other related information.

Electrical effects accompanying the stick-slip phenomenon of sliding of metals on plastics and lubricated surfaces. G. W. Sohl, J. Gaynor, and S. M. Skinner. Trans. ASME *79*, 1963-70 (Nov. 1957). The electrical transients that accompany the stick-slip phenomenon in boundary lubrication were investigated. The phenomenon was investigated with unlubricated metal-metal contact, lubricated metal-metal contact, and metal-plastics contact. The plastics used were saran, Mylar, polyvinyl chloride, polyester, polymethyl methacrylate, and Teflon. In tests with plastics, the electrical discharges occurred just as the slip started and their size depended on the plastic under test. Saran showed the greatest area under the transients per unit change in drag and Teflon and Mylar showed large transients in relation to the accompanying stick-slip. The charge on the plastic was negative after the contact. A charge-discharge mechanism rather than a thermoelectric potential or dielectric breakdown mechanism is indicated.

Halogen-vapor transmission. M. R. Rogers, E. Pillion, and A. M. Kaplan. Modern Packaging *30*, 176-78, 238, 240 (Nov. 1957). A study was made of several plastics films, film-to-paper, and film-foil-paper laminates which could be used for packaging solid chlorine disinfectant and iodine water purification tablets under extremes of climatic conditions. The materials were tested in both sheet and pouch form at 37° C.

Adhesive strength of glass cloth embedded in polyester plastics. W. Hinz and G. Solow. Silikat Tech. *8*, 178-85 (1957). Polyester resins have a greater adhesion to glass cloth than inorganic binders. Cation-active finishes on the glass cloth are not recommended except for the case of moist curing. Unsaturated chlorosilanes such as vinyl trichlorosilane strikingly improve adhesion. Low-alkali glass cloths give the best adhesion if cation-active agents are not used. Moisture always reduces adhesive strengths. Adhesion is improved in low-alkali glasses if sodium ions are replaced by lead or zinc ions. Treatment of high-alkali glasses with bismuth solutions lowers an already poor adhesion value.

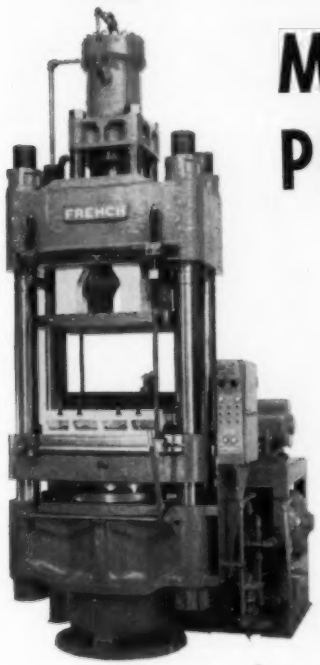
Heats of wetting of modified collagen and other materials. J. R. Kanagy and J. M. Cassel. J. Am. Leather Chemists' Assoc. *52*, 248-59 (1957). Polyethylene, polymethyl methacrylate, polystyrene, polyvinyl chloride, polyvinyl alcohol, ethyl cellulose, casein, zein, starch, Vicara, Acrilan, Dacron, Dynel, and Orlon were among the materials whose heats of wetting were determined. The basic and acidic groups of

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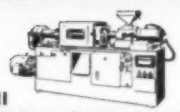
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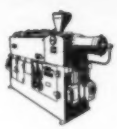
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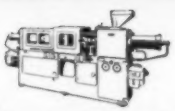
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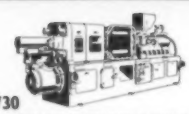
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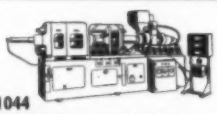
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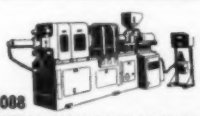
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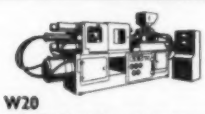
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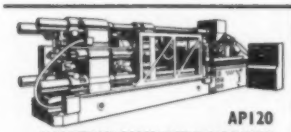
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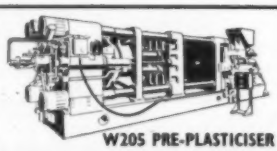
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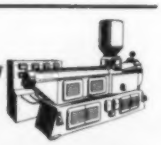


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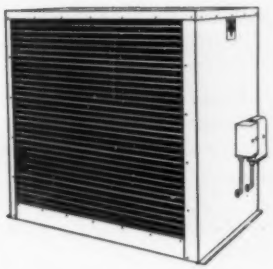
Synthesis of a polyampholyte of regular structure. C. S. Marvel and W. W. Moyer, Jr. J. Am. Chem. Soc. *79*, 4990-94 (Sept. 20, 1957). The synthesis of a polyampholyte having unequivocally regular, isolated amphoteric units is described. The monomer was obtained after a series of eleven preliminary intermediates were prepared. The polymer was obtained consistently in high (90 to 100%) conversions but only relatively low-molecular-weight polymer was produced. The low-molecular-weight was attributed to precoagulation of the polymers during the polymerization.

New concept in polymer chemistry. L. F. Hatch. Petrol. Refiner *36*, 169-71 (Apr. 1957). A review of crystalline isotactic olefin polymers is given.

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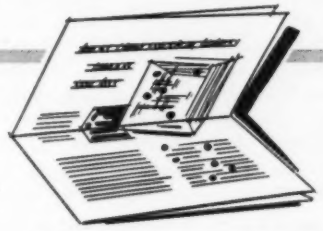


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Resins. C. J. Knuth (to Chas. Pfizer). U. S. 2,811,496, Oct. 29. Vinyl halide resins.

Polymers. J. F. Weiler (to Olin Mathieson). U. S. 2,811,498, Oct. 29. Plasticized polyvinyl chloride.

Polymers. P. J. Stedry (to Minnesota Mining). U. S. 2,811,501, Oct. 29. Vulcanized fluoroacrylate polymers.

Composition. D. E. Peterson and W. F. Bruksch (to U. S. Rubber). U. S. 2,811,504, Oct. 29. Synthetic rubber-copolymer resin blend.

Composition. R. M. Schulken and J. W. Tamblyn (to Eastman Kodak). U. S. 2,811,505, Oct. 29. Polymethacrylonitrile composition.

Resin. W. E. Kleinicke (to Allied Chemical). U. S. 2,811,508, Oct. 29. Condensation of phenol, an aldehyde, and trichloroacetic acid.

Polymers. D. A. Smith, A. C. Smith, and C. C. Unruh (to Eastman Kodak). U. S. 2,811,509, Oct. 29. Light sensitive polymers.

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Cellulose ethers. G. P. Touey (to Eastman Kodak). U. S. 2,811,519, Oct. 29. Mixed cellulose ethers.

Resins. P. J. Garner and R. E. Bowman (to Shell). U. S. 2,812,267, Nov. 5. Resins plasticized with esters of sulfur-containing alcohols.

Copolymers. G. Nischk, E. Muller, O. Bayer, and K. Raichle (to Bayer). U. S. 2,812,313, Nov. 5. Copolymers of amino group-containing polyesters.

Copolymers. J. A. Price and W. M. Thomas (to American Cyanamid). U. S. 2,812,315, Nov. 5. Copolymers of hydroxynitriles.

Polymers. G. R. Barrett (to Monsanto). U. S. 2,812,317, Nov. 5. Hydrolyzed polyacrylonitrile.

Polymerization. R. M. Kreager and E. J. Leeson (to B. F. Goodrich). U. S. 2,812,318, Nov. 5. Granular polymerization of vinyl chloride.

Mold. A. Quinche and E. Lecluyse (to Uni-Tubo). U. S. 2,812,548, Nov. 12. Mold for plastic collapsible containers.

Film. M. A. Chavannes. U. S. 2,812,-550, Nov. 12. Stretched thermoplastic film.

Impregnation. D. C. Mitchell and D. A. Starkey (to Glacier Metal). U. S. 2,813,041, Nov. 12. Impregnating porous metal with polytetrafluoroethylene.

Boats. W. F. Hickson (to Continental Copper and Steel). U. S. 2,813,050, Nov. 12. Molded plastic boats.

Bonding. G. Nischk, E. Muller, and O. Bayer (to Bayer). U. S. 2,813,055, Nov. 12. Bonding materials with polyester-olefinic monomer compositions.

Resins. L. J. Biro. U. S. 2,813,071-2, Nov. 12. Thermosetting resins.

Adhesive. D. V. Redfern and G. F. Baxter (to American Marietta). U. S. 2,813,082, Nov. 12. Adhesive from monohydric phenol-formaldehyde resin and sodium silicate.

Resins. P. Robitschek and G. C. Schweiker (to Hooker). U. S. 2,813,-086, Nov. 12. Sulfur-containing crosslinked polyester elastomers.

Polymers. H. H. Roth (to Dow). U. S. 2,813,087, Nov. 12. Water-soluble sulfonation products from polymers of vinyltoluene and acrylonitrile.

Polymers. K. Meinel (to Wacker-Chemie). U. S. 2,813,088, Nov. 12. Polymeric nitrogen-containing derivatives of acrylamide.

Plastic mixing. J. M. Hausman. U. S. 2,813,300, Nov. 19. Ram-type mixing apparatus.

Sheeting die. W. M. Underwood (to Monsanto). U. S. 2,813,301, Nov. 19. Sheet extrusion die.

Homogenizer. H. G. Beck (to General Tire). U. S. 2,813,302, Nov. 19. Homogenizer-extruder.

Molding. G. M. Stevenson and C. E. Stevenson. U. S. 2,813,303, Nov. 19. Molding machine.

Spray device. F. E. Barrett (to Sealzit). U. S. 2,813,751, Nov. 19. Apparatus for spraying a plastic of the polyester type.

Films. W. Steuber (to Du Pont). U. S. 2,813,775-6, Nov. 19. Forming films and filaments from polymer intermediates.

Foam plastics. O. Vieli (to Spumalit-Anstalt). U. S. 2,813,780, Nov. 19. Machine for forming hardenable plastic foams.

Absorbing resin. W. R. Lyman and A. F. Preuss, Jr. (to Rohm & Haas). U. S. 2,813,838, Nov. 19. Boron-absorbing resin for removing boron compounds from solution.

Foamed silicon resins. J. B. Rust and L. Spialter (to Montclair Research and Ellis-Foster). U. S. 2,813,-839, Nov. 19. Foams from self-frothing silicon resins.

Resin. J. A. Parker and E. J. Pieper (to Armstrong Cork). U. S. 2,813,841, Nov. 19. Alkyd resin comprising tall oil and pentaerythritol.

Polyvinyl chloride. J. Dazzi (to Monsanto). U. S. 2,813,842, Nov. 19. Cyano-dicarboxylic acid ester plasticizer.

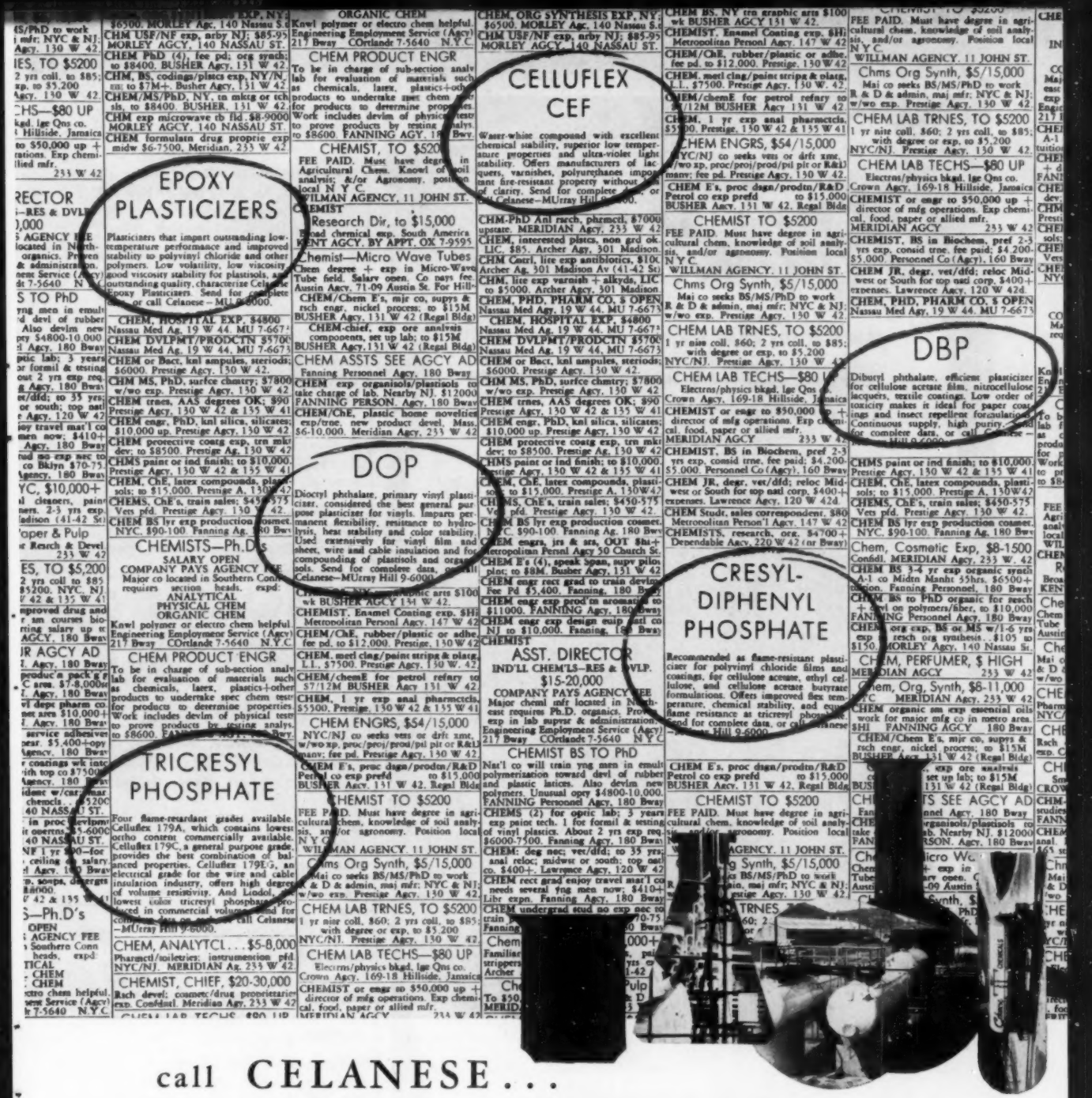
Resin. J. Werner, R. Steckler, and F. A. Hessel (to General Aniline). U. S. 2,813,844, Nov. 19. Amine-formaldehyde resin modified with vinyl pyrrolidone polymers.

Polymers. G. L. Wesp and R. J. Slocombe (to Monsanto). U. S. 2,813,845, Nov. 19. Stabilized polyacrylonitrile.

Condensates. E. Farber and M. Sciascia (to Timer Engineering). U. S. 2,813,846, Nov. 19. Condensates of furfuryl alcohol.

Copolymers. D. C. Guth and F. C. Schaefer (to American Cyanamid). U. S. 2,813,847, Nov. 19. Copolymers of cyanoalkyl vinyl ethers.

Copolymers. J. T. Barr (to Pennsalt). U. S. 2,813,848, Nov. 19. Co-



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polymers of 1-chloro-2,2-difluoroethylene and 2,2,2-trifluoroethyl vinyl ether.

Polymerization. R. J. Kern (to Monsanto). U. S. 2,813,849, Nov. 19. Thermal polymerization using thiuram disulfides as initiators.

Polymerizing. C. P. Van Dijk and F. J. F. Van der Plas (to Shell). U. S. 2,813,850, Nov. 19. Polymerizing unsaturated compounds in aqueous medium.

Extruder. W. L. Bulkley, A. A. Harban, J. R. Krebs, and C. J. Ryant, Jr. (to Standard Oil). U. S. 2, 814,070, Nov. 26. Plastic extruder.

Tubes. J. Allan and H. Samuel (to British Celanese). U. S. 2,814,071, Nov. 26. Extruding plastic tubes.

Molding. R. L. Butzko (to Auto Vac). U. S. 2,814,074, Nov. 26. Vacuum forming of thermoplastic sheet.

Fabrics. L. J. Moncrieff (to British Celanese). U. S. 2,814,077, Nov. 26. Embossing thermoplastic fabric.

Pipe. H. C. Tate (to Cordo). U. S. 2,814,313, Nov. 26. Pipe formed by wrapping glass fabric impregnated with a curable resin around a mandrel and curing.

Cellulose ether. A. W. Sloan (to Atlantic Research). U. S. 2,814,570, Nov. 26. Cellulose ether compositions.

Coating. L. J. Nowacki (to Synthetasine). U. S. 2,816,084, Dec. 10. Epoxy resin coatings.

Resin. T. Anas and S. H. Rider (to Monsanto). U. S. 2,816,085, Dec. 10. Modified phenolic resin.

Resin. M. T. Harvey and P. L. Rosamilia (to Harvel). U. S. 2,816,-086, Dec. 10. Butadiene-furfural reaction products combined with vinyl polymers.

Polymers. H. W. Coover, Jr. (to Eastman Kodak). U. S. 2,816,087, Dec. 10. Modified polyvinyl alcohol polymers.

Polyesters. R. M. Schulken, Jr. and L. D. Moore, Jr. (to Eastman Kodak). U. S. 2,816,088, Dec. 10. Linear polyester compositions.

Resins. W. D. Willis (to Hercules). U. S. 2,816,089, Dec. 10. Vulcanizable polysiloxane compositions.

Resins. G. M. Wagner (to Olin Mathieson). U. S. 2,816,090, Dec. 10. Phenol-dichlorophenol-formaldehyde resins.

Polymers. A. C. Smith, Jr., J. L. Williams, and C. C. Unruh (to East-

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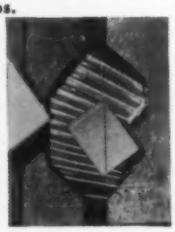
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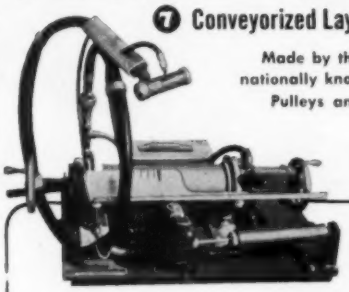
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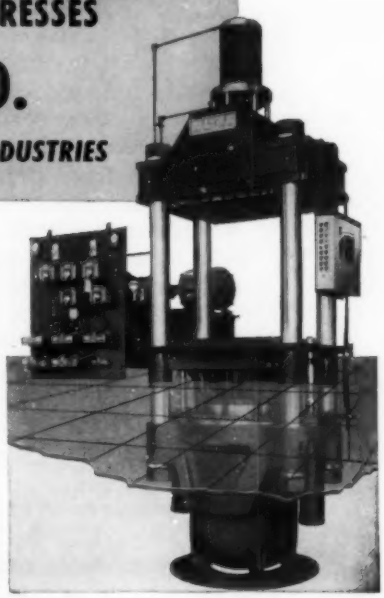
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man Kodak). U. S. 2,816,091, Dec. 10. Light-sensitive polymeric chalcones.

Resins. R. E. Kelly (to Hercules). U. S. 2,816,092, Dec. 10. Cationic urea resins.

Adhesive. H. W. Coover, Jr. (to Eastman Kodak). U. S. 2,816,093, Dec. 10. Adhesive containing alpha-cyanoacrylate esters.

Terpolymers. D. L. Swanson (to American Cyanamid). U. S. 2,816,095, Dec. 10. Terpolymer of methylstyrenes.

Interpolymer. R. T. Morrisey (to B. F. Goodrich). U. S. 2,816,098, Dec. 10. Brominated isoolefin polyolefin interpolymers.

Cellulose derivatives. C. J. Malm and L. W. Blanchard, Jr. (to Eastman Kodak). U. S. 2,816,104-5-6-7, Dec. 10. Cellulose esters.

Polymers. F. B. Stilmar (to Du Pont). U. S. 2,814,605-6, Nov. 26. Polyurethane polymers.

Resins. G. M. Wagner (to Olin Mathieson). U. S. 2,814,607, Nov. 26. Phenol-dichlorophenol-formaldehyde resins.

Resins. C. A. Braidwood and R. W. Hamre (to Schenectady Varnish). U. S. 2,814,610, Nov. 26. Polymerizing terpene with Friedel-Crafts catalyst.

Cellulose ethers. A. W. Sloan, W. D. Stewart, and W. L. Wachtel (to Atlantic Refining). U. S. 2,814,-618-9-20, Nov. 26. Aliphatic ethers of cellulose.

Elastomer. N. W. Hess and W. F. Dacey (to U. S. Rubber). U. S. 2,814,834, Dec. 3. Dipped articles of polyurethane elastomer.

Structural members. W. D. O'Morrow (to Chemiglas). U. S. 2,814,842, Dec. 3. Reinforced plastic structures.

Pipe. W. B. Kleiner, G. N. Carmichael, and C. de Ganahl. U. S. 2,815,-043, Dec. 3. Reinforced plastic pipe.

Polyester. J. G. Klein, E. W. Meyer, and L. C. Grotz (to Glidden). U. S. 2,815,333, Dec. 3. Stabilized polyester compositions.

Polymers. L. M. Welch (to Esso). U. S. 2,815,335, Dec. 3. Divinylbenzene modified polymers.

Quilted material. J. W. Howden (to Permex). U. S. 2,816,054, Dec. 10. Quilted plastic material.

Polymerizing. K. C. Brinker and R. M. Ross (to Du Pont). U. S. 2,816,082, Dec. 10. Polymerizing a fluoroethylene in water.



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Books & Booklets

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"How to Build Fiberglass Boats"

By Charles Bell

Published in 1957 by Coward-McCann, Inc., 210 Madison Ave., New York 16, N. Y. 202 pages. Price: $6.50.

This comprehensive manual of reinforced plastics boat-building techniques includes information on how to improve and repair any wood boat with reinforced plastics. In separate chapters, the book covers glass fibers, liquid plastics resins, and mold construction. Design and solution to usual design problems are treated, as are also lamination and fabrication techniques. All operations are made clear with pictures and sketches. The last chapter is concerned with "Where to buy it."

"Symposium on structural sandwich considerations," (A.S.T.M. Special Technical Publication No. 201)

Published in 1957 by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 108 pages. Price: $2.75 ($2.00 to A.S.T.M. members).

Included in this book are 10 papers presented at the second Pacific Area National Meeting of A.S.T.M. on Sept. 20, 1956, and the discussions of them. Topics covered include adhesives bonds in sandwich structures; sandwiches for architectural panels; recent developments in sandwich construction; and testing of sandwiches.

"Concise Guide to Plastics"

By H. R. Simonds

Published in 1957 by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 329 pages. Price: $6.95.

Accurately named, this little book covers an amazing amount of ground rather well. Subjects dealt with include properties of commercial plastics, forms in which they are available, production and prices, applications, processing, tables that will help in selecting the proper plastic for a given purpose, a chapter of prognostication, a list of tradenames, and an index.

"Handbook of Chemistry and Physics," 39th Edition

C. D. Hodgman, Editor in Chief

Published in 1957 by the Chemical Rubber Publishing Co., 2310 Superior Ave., N. E., Cleveland 14, Ohio. 3235 pages. Price: $9.00.

This famous handbook is packed with useful information on thermal, mechanical, electrical, and chemical properties of plastics and other materials. The mathematical tables, which were reviewed separately in MODERN PLASTICS 35, 186 (Jan., 1958), are very complete. Holders of old editions take note: the book has grown 531 pages in the last nine editions. Many of the "laboratory arts and recipes" are useful in the shop, too. The tables of definitions and formulas, and of units and conversion factors are exhaustive. A special India paper version is only 2.3 inches thick.

"Polyethylene"

By T. O. J. Kresser

Published in 1957 by Reinhold Publishing Corp. (the first of the publisher's planned plastics applications series), 430 Park Ave., New York 22, N. Y. 224 pages. Price: $4.95.

About this little volume, the author says, "[it] gives a brief summary of the status of polyethylene applications at present, with a little history and projection to bring it into reasonable perspective. Without going into any great technical detail, I have tried to show how polyethylene is produced, and how it is made into useful articles . . . I have selected a few [applications] and tried to show . . . why polyethylene was used for these purposes." After chapters on history, properties, chemistry, and manufacture, the author takes up pipe and coated wire, and molded and formed objects. He closes with a chapter on future prospects.

Industrial chemicals. Characteristics, grades, and containers for 24 organic, inorganic, and specialty chemicals used by industry, together with the location of the production point for each product. 16 pages. *Olin Mathieson Chemical Corp., Industrial Chemicals Div., Baltimore 3, Md.*

Styrene molding compounds. A comparative properties chart, formulations, and granulations of general-purpose, high-flow heat-resistant, medium-, high-, and super-high-impact styrene molding compounds. 6 pages. *Catalin Corp. of America, 1 Park Ave., New York 16, N.Y.*

Translucent panels. Why Ray-O-Lite translucent fibrous glass awnings and patio roofs are different, how style and color harmony compares with other awnings and patios, and factors in the selection of the most desirable color, are among the topics dealt with in, "Got a Question About Ray-O-Lite?" 12 pages. *Ray-O-Lite Corp. of America, 316 Peachtree St., N. E., Atlanta, Ga.*

Epoxy casting resin. Bulletin sheet describes the use of Maraset resin #341, a lead-filled epoxy casting material, for fabricating radioactivity-shielding containers and structures, and in applications in instrument housings and pipe and valve fittings. *Marblette Corp., 37-31 Thirtieth St., Long Island City 1, N.Y.*

Fire protection. "Use of Fire Resistant Hydraulic Fluids in the Plastics Industry," designed to curb hydraulic fluid fires and explosions, discusses physical characteristics and properties of a class of fire-resistant hydraulic fluids. 2 pages. "Winterizing Fire Protection Equipment," deals with

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proper equipment check-up for water supplies, sprinkler systems, hose standpipes, yard hydrants and hydrant hose houses, portable fire extinguishers, and buildings. 2 pages. *The Society of the Plastics Industry, Inc., 250 Park Ave., New York 17, N. Y.*

Elastomer-phenolic film adhesives. Product report describes Plymaster V-2 and V-3—low-cost, 100% reactive elastomer-phenolic film adhesives for the flat-surface bonding of all plastics and metals. 10 pages. *Rubber & Asbestos Corp., 225 Belleville Ave., Bloomfield, N.J.*

Resins. Physical and chemical data, melt viscosities, compatibilities, and solubilities of Picco coumarone-indene resins, modified styrene resins, and plasticizers. 12 pages. *Pennsylvania Industrial Chemical Corp., Clairton, Pa.*

Daylight fluorescent pigments. Characteristics, properties, and uses. Data on materials put into plastics to make them fluoresce during daylight. Form 1115. 14 pages. *Switzer Brothers, Inc., 4732 St. Clair Ave., Cleveland 3, Ohio.*

Saran shapes. Technical data, shapes, sizes, and prices of saran rod, sheet, tape, pipe, tubing, and fittings. Bulletin SPP-557. 8 pages. *Pyramid Plastics, Inc., 554 W. Polk St., Chicago 7, Ill.*

Decal materials. Processing data, properties, and sizes of Fascal vinyl and metallized Mylar sheet with high tack adhesive backing for signs, labels, nameplates, etc. Included are illustrations of typical signs used by Heinz Co., RCA Whirlpool, the Yellow Pages, etc. 4 pages. *Fasson Products, Painesville, Ohio.*

"Fastener Fact File" gives complete design and purchasing information on rivets and riveting machines, an evaluation questionnaire for fastener determination, and a rivets standard chart said to be the first in the industry. 42 pages. *Judson L. Thomson Mfg. Co., Waltham 54, Mass.*

Thickness gages. Nondestructive method of determining the extent of corrosion, erosion, or scale buildup on pipe walls with AccuRay portable pipewall thickness gages. Bulletin N.I. 157. 8 pages. *Industrial Nucleonics Corp., 1205 Chesapeake Ave., Columbus 12, Ohio*

Plastics insulators. "The Case of the Insidious Insulators" or "Why Circuits Go Dead When They Don't Have To" discusses failures caused by deterioration of some plastics insulators and suggests remedies. *Mesa Plastics, 11751 Mississippi St., W. Los Angeles 25, Calif.*

Plastic flex-plug valve. Construction, flow, sizes, and dimensions of PVC or styrene copolymer gate valves used in pipe lines conveying corrosive and abrasive liquids. 4 pages. *Vanton Pump & Equipment Corp., 201 Sweetland Ave., Hillside, N. J.*

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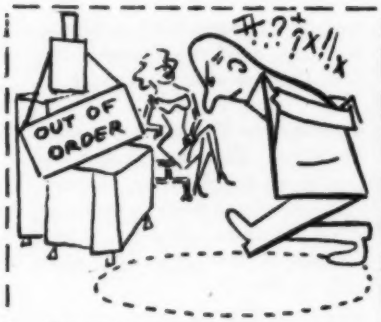
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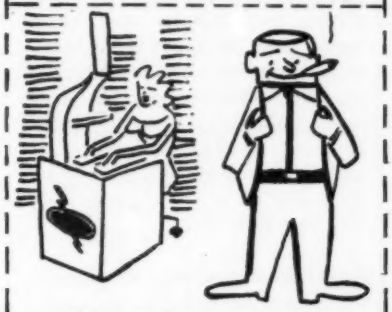
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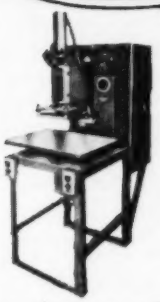
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Vinyl resins for surface coating. Properties, solution characteristics, viscosity, compounding, chemical resistance, and adhesion. Booklet G.6. 16 pages. *British Geon, Ltd., Devonshire House, Piccadilly, London W1, England.*

Vinyl gravure inks. Technical data, uses, recommendations, production techniques, etc., for heat-sealable vinyl inks. Bulletin 420. 2 pages. *Claremont Pigment Dispersion Corp., 39 Powerhouse Rd., Roslyn Heights, L.I., N. Y.*

Plastics lab ware. Information on Teflon sheets, skived tape, tubing, rods, beakers, stopcock plugs, stirrer blades, and Teflon-coated glass aprons, as well as new polyethylene lab ware. Bulletin 581. 4 pages. *Bel-Art Products, 4917 Murphy Pl., W. New York, N. J.*

Teflon hook-up wire. Properties and available sizes for Teflon-insulated, silver-plated copper wire for use in aircraft, rocket, and missile wiring; distribution and power transformers; and motors. Bulletin T-500. 2 pages. *Haveg Industries, Inc., 900 Greenbank Rd., Wilmington 8, Del.*

Fatty acids. Specifications and characteristics of stearic and oleic acids, Hyfac hydrogenated fatty acids and glycerides, animal and vegetable fatty acids, and Hyfac castor oil derivatives. 4 pages. *Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio.*

Decorating. Uses, properties, application, standard and matched colors, handleability, etc. of letter-fill and dry-wipe paints. 2 pages. Data Sheet X-134. *Logo Inc. Div., Bee Chemical Co., 12933 S. Stony Island Ave., Chicago 33, Ill.*

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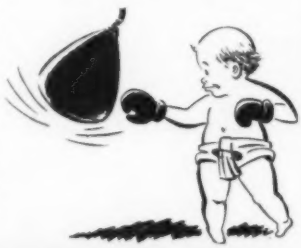
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pounds. 20 pages. *Marbon Chemical, Div. of Borg-Warner Corp., 7165 Chicago Ave., Gary, Ind.*

Conveyors. Descriptive booklet illustrates roller conveyors, wheel conveyors, spiral chutes, belt conveyors; storage lines; accessories; etc. Catalog 36. 42 pages. *Logan Co., 100 N. Buchanan St., Louisville 6, Ky.*

Extender. Bulletin 111 gives technical data on Indulin, an extender for phenolic and furan resins used for paper sheet saturation, foundry cores, shell molds, plywood, adhesives, fibrous glass mats, and binding agent for particle and composition board. 2 pages. *Polychemicals Div., West Virginia Pulp & Paper Co., Charleston A, S. C.*

Protective coating. Functional characteristics and data on moisture and weather resistance, aging properties, impact resistance, adhesion, temperature resistance, etc. of Mono-Seal synthetic resin coating, a special blend of silicones and epoxies. Bulletin MS-57 CFP. 14 pages. *Mono-Seal Products, 44 Garden St., Everett 49, Mass.*

Research service. Description of work, policies, personnel, facilities, and services of company doing research in the chemistry and physics of paper, plastics, and elastomers, as well as textiles and associated industries. 28 pages. *Fabric Research Laboratories, Inc., 1000 Providence Hwy., Dedham, Mass.*

Extruders. Details of a line of high-speed, self-regulating screw-type extruders; their performances, efficiency, and theoretical principles are discussed. 32 pages. *Alpine AG., Maschinenfabrik und Eisengiesserei, Augsburg, Goggingер Landstr. 66, Germany.*

Laminated plastics. Stock list of laminates, including standard sheets, rod and engraving stock, and copper-clad grades. 2 pages. *Formica Corp., 4614 Spring Grove Ave., Cincinnati 32, Ohio.*

Heat exchangers and condensers. Applications, basic designs,

construction features. Bulletin 949. 28 pages. *The Pfaudler Co., 1000 West Avenue, Rochester 3, N. Y.*

Vinyl plastisol. Uses of Indusol, a liquid vinyl plastisol, in coating and molding. 8 pages. *Industrial Solvents & Chemicals, Inc., Wilkinsonville, Mass.*

Rotary batch blenders. Types, sizes, specifications, and descriptive data. Bulletin 080B. 4 pages. *Sturtevant Mill Co., Park and Clayton St., Dorchester, Boston 22, Mass.*

Machining thermoplastics. Recommended procedures for machining and finishing thermoplastic sheets, rods, and tubes, including sawing, routing, drilling, turning, shearing, punching, grinding, and finishing. 8 pages. *Cadillac Plastic & Chemical Co. 15111 Second Ave., Detroit 3, Mich.*

Properties chart. Comparative properties of GE's Lexan polycarbonate resin and other thermoplastic molding materials. Chart CDD-5. 4 pages. *Chemical Development Dept., General Electric Co., 1 Plastics Ave., Pittsfield, Mass.*

Plastic fabrication. Data folder on services available from custom fabricator and model maker. 4 pages. *Alda Plastics, 154 Grand St., New York 13, N. Y.*

Cast acrylic sheet. Outstanding features, uses, characteristics, and physical properties of Evr-Kleer cast sheet. 4 pages. *Cast Optics Corp., 123 Newman St., Hackensack, N. J.*

Polyethylene. Properties and uses of A-C low-molecular-weight polyethylene. Bulletin P/S 234. 4 pages. *Semet-Solvay Petrochemical Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.*

Plasticizers. Chemical and physical properties, performances, viscosity characteristics, etc. of Polycizers 162 (DOP), 332 (DOA), 532 (ODA), 562 (ODP), 632 (DDA), and 662 (DDP). Bulletin

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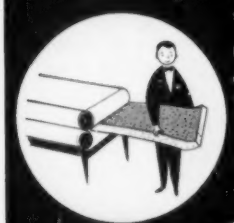


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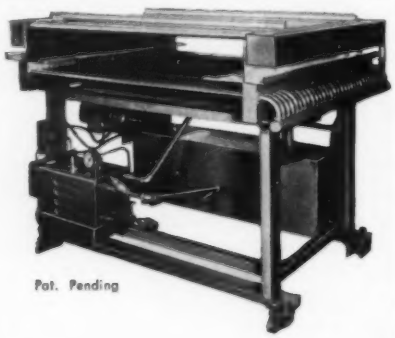
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07-75-3-10-57. 4 pages. *Harwick Standard Chemical Co., 60 S. Seiberling St., Akron 5, Ohio.*

Plasticizers and dispersions. "Kenplast light-colored secondary vinyl plasticizer," 4 pages; "Premixed accelerator dispersions for butyl, neoprene, and Hypalon," 12 pages; and "Plasticizers, processing oils, and resin for various rubbers and vinyls," 14 pages. *Kenrich Corp., 57-02 48th St., Maspeth 78, N. Y.*

Flexographic equipment. Operational data based on a survey of 496 flexographic presses in 62 printing plants. 8 pages. Price: $1.00. *Packaging Institute, 342 Madison Ave., New York 17, N. Y.*

Small moldings. "This is GRC" explains some of the different types of standard thermoplastic molded and die-cast items, as well as contract items, produced by this firm. 1 page. *Gries Reproducer Corp., 125 Beechwood Ave., New Rochelle, N. Y.*

Distributor. "Plastics for Industry" gives price lists, sizes, and technical data for plastics sheets, rods, and tubes of all kinds. 66 pages. *Commercial Plastics & Supply Corp., 630 Broadway, New York 12, N. Y.*

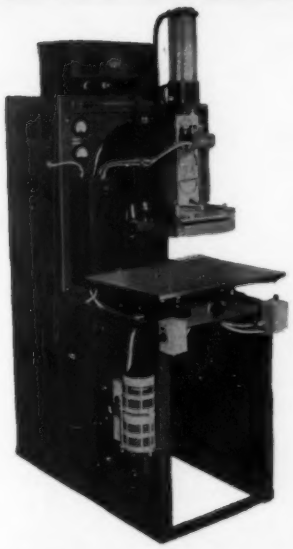
Injection molding machine. Applications, specifications, and construction details of the 3/4-oz. APM Model 21 hand-operated bench injection molding machine. 4 pages. *British Machines & Foundry Supplies, Ltd., 80 Shore Rd., Port Washington, N. Y.*

Casting resins. Electrical and mechanical properties, prices, and viscosity of Hysol 6900 epoxy resins designed for casting of transformers, coils, magnetic amplifiers, etc., plus handling instructions. 5 pages. *Houghton Laboratories, Inc., Olean, N. Y.*

Polyethylene drums. "Evaluation of Molded Polyethylene Drums in Steel, Plywood, and Wirebound Overpacks" gives results of tests on molded polyethylene drums in steel drum overpacks. Recommendation: that polyethylene drums be considered

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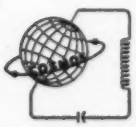
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as replacement for glass or ceramic liners in rigid shipping containers for corrosive and sensitive materials. Report PB 121907. Price: 50 cents. 16 pages. *OTS, U.S. Department of Commerce, Washington 25, D. C.*

RP tanks. "Evaluation of Five Types of Containers for Jettisonable Fiberglass Fuel Tanks." Report PB 131187. Price: 50 cents. 15 pages. *OTS, U.S. Department of Commerce, Washington 25, D. C.*

Air and hydraulic cylinders. Extensive engineering data on 200 p.s.i. non-rotating air cylinders, Bulletin A-105K, 10 pages; high pressure hydraulic cylinders, Bulletin H-104K, 8 pages; fluid pressure boosters and accumulators, Bulletin B-200, 12 pages; JIC pneumatic standards for industrial equipment, 12 pages; pressure and flow charts for air and hydraulic cylinders, 2 pages; cylinders in stock, 2 pages; reciprocating boosters, 4 pages; and details on new line of hydraulic cylinders, 8 pages. *Miller Fluid Power Div., Flick-Reedy Corp., 2040 N. Hawthorne, Melrose Park, Ill.*

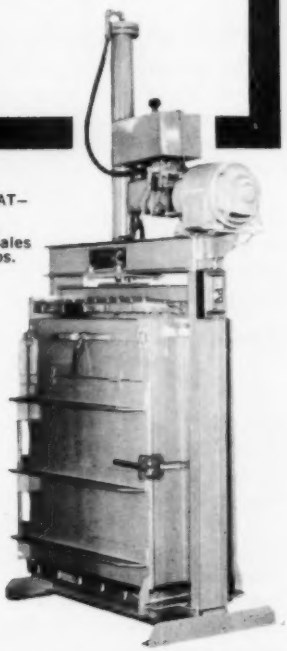
Polyethylene lab ware. Catalog on available laboratory apparatus and equipment made of polyethylene. Catalog 57P. 16 pages. *Schaar & Co., 7300 W. Montrose Ave., Chicago 34, Ill.*

Marking machines. Technical data and descriptions of a line of hot-stamping, wire, and tube marking machines. Included are manual and automatic models and accessories. Bulletins 8A to 8K and 14G to 14N. 1 page each. *The Acromark Co., 7-15 Morrell St., Elizabeth 4, N. J.*

Thermoplastic sheet and film. Data file and uses of Campco styrene, cellulosic, and polyethylene sheet materials. 6 pages. *Campco Div., Chicago Molded Products Corp., 2717 N. Normandy Ave., Chicago 35, Ill.*

Company services. Outline of complete line of products and activities of major plastics firm. 34 pages. *Koppers Co., Inc., Koppers Bldg., Pittsburgh 19, Pa.*

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Portable sprue grinder

The Model M-1 sprue grinder, though portable, has a 6.5- by 7-in. feed throat. A 1-hp. motor (supplied at additional cost) is required. This machine is also designed for bench mounting or for direct machine mounting. Grinder is easily dismantled for cleaning. *Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20, Ohio.*

Speed variators

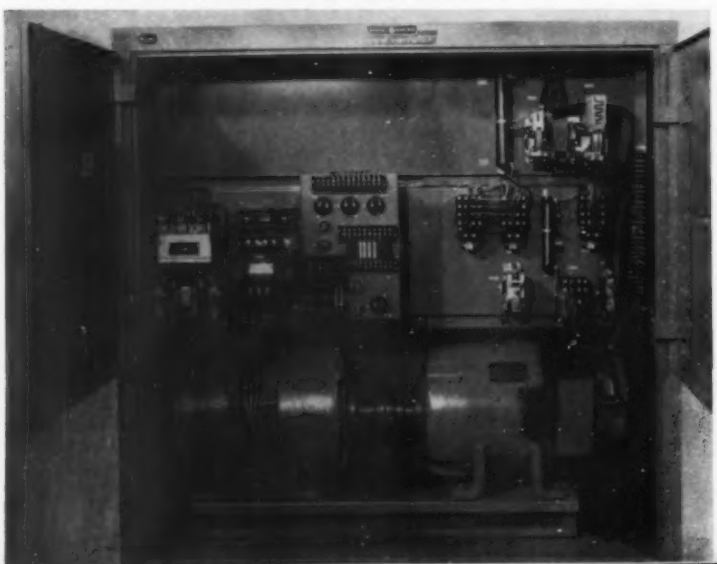
A new line of motor-generator (M-G) d.-c.-driven extruders and other machinery offers several advantages. Available in units up to 500 hp., these variators are equipped with Amplistat regulators to minimize variation in speed with changes in load. Minimized and simplified maintenance have been accomplished by several new features: 1) long-life silicon rectifier excites d.-c. generator; 2) two-unit, flexibly coupled, four-bearing M-G set mounted on metal pallet can be lifted out with fork truck; 3) all terminals are located at front, laid out for fast, accurate connections; 4) set is entirely enclosed in sheet-metal cabinet; and 5) air drawn in for cooling is drawn through replaceable cleaners. Normal speed range is 8 to 1, but ranges up to 200 to 1 are available. Because all parts are accessible from the front, units may be mounted back-to-back, end-to-end, against wall, in corners. *General Electric Co., Schenectady 5, N.Y.*

Thermoset molding presses

A 100-ton, upward-acting, semi-automatic transfer molding press, equipped with top-mounted transfer cylinder, has 36- by 16-in. platens. The clamp stroke is adjustable up to 12 in., daylight is 30 in., transfer stroke is 9 in., force is 8 to 25 tons, and ejector system develops 10 tons. With the addition of automatic loading, preheating, and feeding equipment, the press becomes fully automatic.

Intended for small-parts production and lab work, the HPM 50-ton, upward-acting, hot-plate press is designed for manual or semi-auto control. Plates, which are 12 by 12 in., can be steam- or electric-heated. Stroke and daylight are each 15 in., hydraulic system is powered by 7.5-hp. motor. *Hydraulic Press Mfg. Co., a Div. of Koehring Co., Mount Gilead, Ohio.*

General Electric Speed Variator, with front doors open and ventilating panels removed. Two-unit, four-bearing motor-generator set, located at bottom, can be lifted out by fork truck



Foam splitter

A levelling and splitting machine is designed to handle blocks of foam up to 84 by 110 in. and up to 24 in. thick. After the first levelling cuts have been made, the machine is fully automatic in splitting, with splitting thickness ranging from 1/16 to 6 inches. The machine is powered by four motors in the 1/2- to 3-hp. range, is about 13 by 20 ft. over-all. Also made in 64- by 96-in. and 64- by 110-in. sizes. *Falls Engineering and Machine Co., Cuyahoga Falls, Ohio.*

Heavy-duty compression press

A 1650-ton, four-column compression press has been especially designed for long curing cycles—up to 45 min. Platen area is 62 by 62 in., daylight is 56 in. Double pump design, which uses a large power pump and a small holding pump, reduces hydraulic heat development and heat-exchange requirements. Cycles may be manually or automatically controlled. *Birdsboro Steel Foundry & Machine Co., 1951 Furnace St., Birdsboro, Pa.*

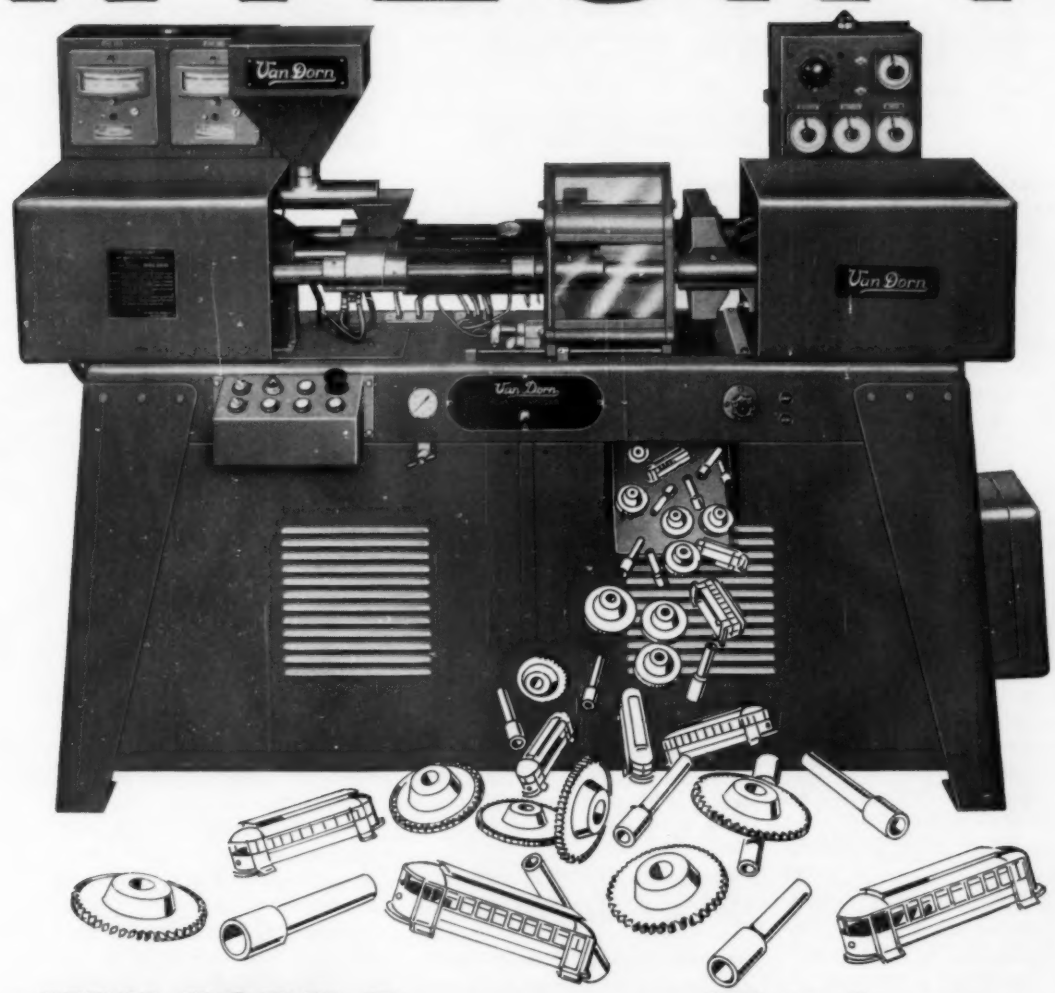
Drying oven

The Foremost Form-Tite oven is said to be the tightest available for drying working quantities of molding powders: tests reported by the maker show that it leaks less than 3% of the volume rate of recirculation. The Model 40 is designed to hold 40 medium-sized trays. (Glass-reinforced polyester trays, which are easy to handle and clean and don't warp, are furnished with the oven.) A 20-tray oven is also offered.

These ovens are available in complete drying systems comprising a recirculating air cooler, a silica-gel, automatically regenerating dryer, and a humidity

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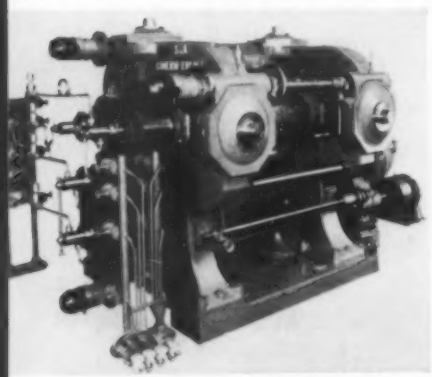
Because the level of humidity in the oven is maintained at nearly zero, drying takes place more rapidly than in ovens that use room air without drying, particularly on humid days. And much lower levels of moisture content in the powder may be achieved. *The Rainville Co., 53 Hilton Ave., Garden City, N. Y.*

Rotary thermoforming machine

The Rotary-Vac three-stage forming machine (see MODERN PLASTICS *34*, 166, Feb. 1957) has been modified to include a double-platen forming station. This permits the user to form deeply drawn products by male assist or snap-back forming. This new feature is said to permit high production of refrigerator liners, large tanks, etc. The molding station has counteracting independently controlled platens with 20-in. strokes, each of which can supply air pressure for blow molding and pressure forming. The heating station is completely enclosed, has two heater banks, 10 and 20 in. above the sheet. Fans assist cooling. *Comet Industries, 9865 Franklin Ave., Franklin Park, Ill.*

Four-roll calender

The Comerio Ercole type CGR-L-4 calender, built in Italy, is now offered in the U.S. The rolls of this inverted-L calender are 20 in. in diameter by 50 in. wide and are cored for circulation of water or steam. Frame and rolls are made of cast iron. The single drive is 60-hp., power being transmitted by individual speed reducers with offsetting joints. A friction ratio of 1:1.2 may be set up between all roll pairs, and the roll apertures are set by a 2-hp. motoreducer. Lubricating oil is pumped to bearings. The maker is represented in the U.S. by *Elmo International, 7 Church St., Paterson, N. J.*



Comerio type CGR-L-4 calender has rolls cored for water or steam circulation

Sheet feeder

A versatile new sheet feeder will handle either flat or formed, rectangular or irregularly shaped sheets. Main purpose of the feeder is to deliver sheets from piles to processing equipment, but it can also remove sheets from conveyors of machine tables for stacking. Sheets may be picked up and delivered horizontally, vertically, or at any angular position. The machine will feed automatically or the feeding cycle can be triggered manually by push button. Sheets up to 6 by 15 ft. are moved by the suction-cup carrier and V-shaped transfer frame. Suction-cups are flexibly mounted so they will conform to the surface of each individual sheet. The machine can feed up to 15 sheets/min. from piles up to 4 ft. high. *The de Florez Co., Inc., 116 E. 30th St., New York, N. Y.*

Vacuum shelf dryers

Vacuum shelf dryers, designed for drying delicate materials sensitive to heat and oxidation, can be used for drying nylon and other molding powders with critical tolerances for moisture. The dryers consist of a number of small compartments wherein 30 mm. Hg absolute can be obtained within 2 min. of closing the door of the vacuum chambers. Tray sizes are 3 by 6 ft.; two- and three-tray machines have manually operated elevator; four-, five,- and six-tray machines have motorized elevator. *Calmic Engineering Co. Ltd., Crewe Hall, Crewe, Cheshire, England.*

Forming and sealing tool

A new kind of tool for thermoplastic fabrication is essentially a flat-bladed soldering iron (see cut). It is available in 50-, 100-, 130-, and 150-w. models. Special attachments are available for special purposes. The tool is handy for cutting thermoplastic fabrics, particularly those made up of monofilaments, for welding and sealing, etc. PVC pipe, for example, can be butt-welded by pressing the square-cut ends to be joined against the blade until they soften, then pressing them together. Blade is copper with aluminum sintered into surface, for hardness and oxidation resistance. Heat is produced by replaceable cartridge heater. *Caig Cosmopolitan, 507 Fifth Ave., New York 17, N. Y.*



Caig Cosmopolitan implement for cutting, sealing, and welding thermoplastics

Hydraulic systems pump

A variable-volume, vane-type pump for hydraulic-circuit power applications, the model S, has a 10 gal./min. capacity, double the size of the manufacturer's Model Q pump. The new pump, subplate-mounted, operates at 1000 p.s.i. and 1800 r.p.m. *Racine Hydraulics & Machinery, Inc., 2000 Albert St., Racine, Wis.*

Four-color press

A four-color flexographic press is designed to work directly in line with a polyethylene extruder. The web can be either rewound or go directly into a bag machine. The press is said to have many features that make it especially applicable to this type of operation. *Wolverine Paper Converting Machinery Corp., 18584 Fitzpatrick Ave., Detroit 28, Mich.*

Scrap sorter

Said to be highly efficient in the removal of metal particles from organic materials, a new labora-











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The impact resistance of this plastic mirrors its *other* strengths. Products made of GREX resist chemicals and acids, for example. They hold their shape when sterilized. They don't become brittle when frozen.

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GREX* in action

Introduction to the Laboratory

Gleaming, chrome-faced cannonballs thud against a newly-molded plastic container. Objects whirl in the ultra-violet light of a test chamber. An endless strip of sandpaper rubs at the surface of a gear.

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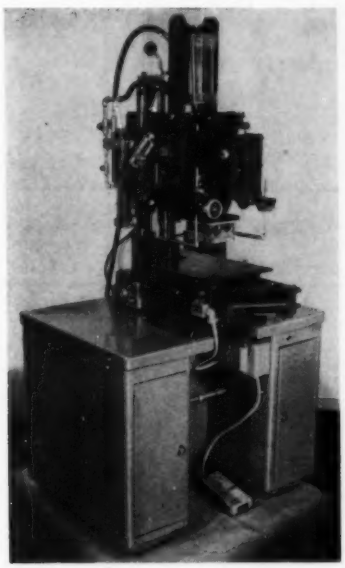
CITY _____ ZONE _____

STATE _____

tory electrostatic separator unit will also remove paper, string, and other contamination. The model ES—16 separator has an integral power supply to furnish the beam-type electrode with 40,000 v. D.C. Rotor speed is variable from 5 to 500 r.p.m. *Carpco Manufacturing Inc., P.O. Box 3272, Jacksonville 6, Fla.*

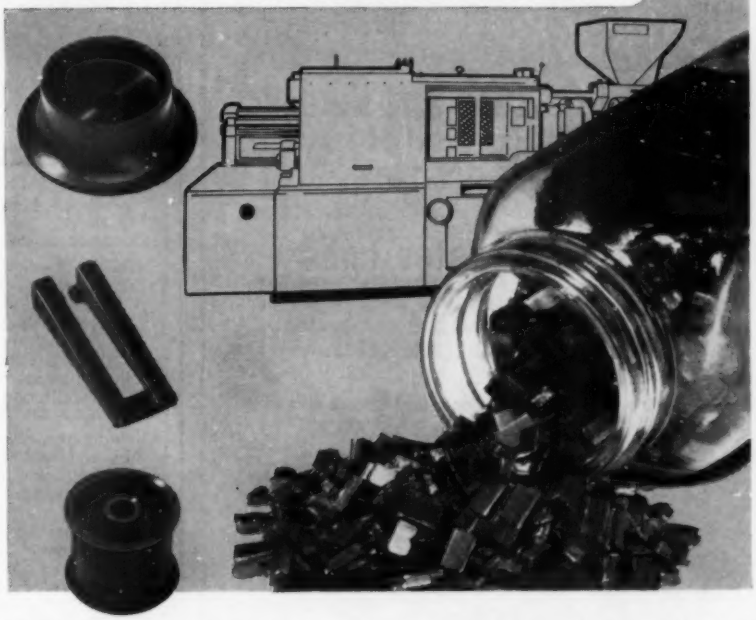
Hot-stamping presses

Three new hot-stamping presses, the Models ABP, NP, and G, have cushioned air cylinders that combine speed of action with gentleness. The Model ABP feeds up to 5 in. of leaf 4.25 in. wide, while the other two can handle 6.5-in.-wide leaf. The heavy-duty G is a desk-type machine (see illustration), the NP is mounted on a simple pedestal, while the ABP is a bench model. All three feature improved automatic roll feed and automatic heat control; they require 60 to 80 p.s.i. air (compressor should be at least 2 hp.). Model G can be had with a side-to-side table or dial table. Model ABP incorporates a micrometer adjustment which is used for the control of impressions. *Peerless Roll Leaf Co., 4511 New York Ave., Union City, N. J.*



Peerless Model G hot-stamping press is a heavy duty, desk-type machine

NYLATRON® GS MOLDING POWDERS



Unique properties of NYLATRON® GS Nylon raise performance of molded parts



When performance specifications demand the very best, parts molded from Nylatron GS will be selected every time. Nylatron GS Powders are a combination of nylon and a dry lubricant — molybdenum disulphide*, now available for high volume, low cost molding of parts. Nylatron GS material is also furnished in standard stock shapes. The increasing use of Nylatron GS parts is proving the value of these outstanding characteristics:

Exceptional Dimensional Stability

Low coefficient of linear expansion and minimum distortion after molding, provides accurate, close tolerance molding.

Low Surface Friction

When wear parts must run dry, Nylatron GS parts operate without lubrication.

High Wear and Abrasion Resistance

Part surfaces resist abrasion and demonstrate long wear in contact with metals.

High Heat Distortion Temperature

Nylatron GS parts provide higher modulus of elasticity and higher heat distortion temperatures than standard nylon 101.

Chemical Resistance

Nylatron GS parts are unaffected by alkalis and most solvents including hydrocarbons.

**Patents applied for*

Write today for detailed information on Nylatron GS and name of your nearest Nylatron GS molder.

SEE POLYMER BOOTH NO. 653
Design Engineering Show—Chicago
April 14-17

NATIONAL POLYMER PRODUCTS, INC.

A Subsidiary of The Polymer Corporation, Reading, Pennsylvania
Export: Polypenco, Inc., Reading, Penna., U.S.A.

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Now... less cost, less delay in making plastic-forming molds, zinc and aluminum die-casting dies... with

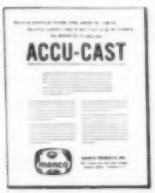
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ACCU-CAST®

without master hobs

Manco's new process precision-casts directly from original patterns... in almost any castable material... eliminating costly die-sinking shopwork.

Manco gives you economical choice of the right material for every job... ACCU-CAST in steel or TRU-CAST in beryllium copper... with faithful detail, dimensional accuracy, impact strength, and long trouble-free service life.



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MANCO PRODUCTS, Inc.
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● You get the finest quality molded products at genuinely competitive prices—and your worries as to delivery dates are eliminated—when you place your order with Textile Rubber Co., Inc.

Due to our productive capacity, we are prepared to run any molds you now own or assist you in having molds built for any special items.

Send us your inquiry today! We'll be pleased to work with you on any custom molding jobs.

TEXTILE RUBBER COMPANY, INC.

General Offices: 259 South Main Street, Akron 9, Ohio
Factory: Bowdon, Georgia

Plastics

Production and sales in 1000 lb.* for October and November 1957

Materials	*Total p'd'n first 11 mos. of 1957‡*	*Total sales first 11 mos. of 1957‡*
Cellulose plastics:[a]		
Cellulose acetate and mixed ester		
Sheet, under 0.003 gage	17,195	16,696
Sheet, 0.003 gage and over	16,775	16,468
All other sheets, rods, tubes	6,743	6,566
Molding, extrusion materials	85,772	84,610
Nitrocellulose sheets, rods, tubes	3,725	3,760
Other cellulose plastics	5,099	4,496
Phenolic and other tar-acid resins:		
Molding materials[a]	169,127	165,218
Bonding and adhesive resins for:		
Laminating (except plywood)	55,491	43,608
Coated and bonded abrasives	15,307	15,405
Thermal insulation	48,196	48,238
Plywood	42,569	33,286
All other bonding uses¶	52,831	51,046
Protective-coating resins	28,151	23,213
Resins for all other uses	34,212	28,852
Urea and melamine resins:		
Textile-treating resins	32,373	31,742
Paper-treating resins	22,806	21,453
Bonding and adhesive resins for:		
Plywood	88,005	84,490
All other bonding and adhesive uses, including laminating	30,149	27,818
Protective-coating resins	33,175	24,999
Resins for all other uses, including molding	81,160	83,266
Styrene resins:		
Molding materials[a]	381,754	369,902
Protective-coating resins	76,882	72,403
Resins for all other uses	133,906	113,415
Vinyl resins, total[b]	766,285	695,562
Polyvinyl chloride and copolymer resins (50% or more polyvinyl chloride) for:		
Film (resin content)		87,846
Sheeting (resin content)		52,130
Molding and extrusion (resin content)		200,807
Textile and paper treating and coating (resin content)[c]		62,525
Flooring (resin content)		75,201
Protective coatings (resin content)		29,446
All other uses (resin content)		43,769
All other vinyl resins for:		
Adhesives (resin content)		38,623
All other uses (resin content)		105,239
Coumarone-indene and petroleum polymer resins	232,791	222,536
Polyester resins	84,508	76,811
Polyethylene resins	622,195	597,349
Miscellaneous:		
Molding materials[a,d]	45,123	44,597
Protective-coating resins[e]	12,239	5,973
Resins for all other uses[f]	123,210	109,975

*Dry basis designated unless otherwise specified. †Revised. ‡Partially estimated. ¶Includes friction materials.
[a]Includes fillers, plasticizers, and extenders. [b]Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production

Production

From statistics compiled by the U. S. Tariff Commission

October†		November‡	
Production	*Sales*	*Production*	*Sales*
1,347	1,568	1,310	1,211
1,639	1,740	1,732	1,702
828	714	611	698
9,663	9,657	7,624	7,936
330	345	339	324
546	552	344	310
20,667	25,133	15,808	8,923
5,476	4,888	4,438	3,445
1,488	1,851	1,257	1,171
4,707	5,257	3,850	3,720
3,834	3,531	3,663	3,154
5,825	6,041	5,812	5,207
2,957	2,358	2,839	1,787
3,321	2,873	2,941	2,430
3,143	3,248	3,147	2,843
1,704	1,866	1,991	1,742
9,379	8,439	7,855	7,208
3,490	3,360	3,278	2,619
3,556	2,568	2,841	2,017
8,217	8,755	6,655	7,380
†39,001	†38,024	34,751	31,388
8,647	7,100	7,100	5,918
13,758	12,735	12,987	10,945
77,088	†72,356	71,535	60,616
	10,747		7,078
	5,102		5,142
	†20,819		16,940
	6,802		6,151
	7,506		6,224
	2,256		1,916
	4,466		4,703
	3,771		3,197
	10,887		9,265
23,088	22,786	19,718	9,558
7,976	7,095	6,589	5,809
62,552	66,806	62,936	58,395
5,075	4,822	4,742	4,431
1,156	609	1,183	479
12,606	10,663	11,304	8,509

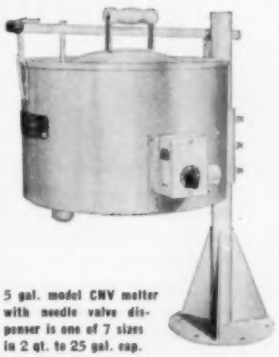
are given. [c]Includes data for spreader and calendering-type resins. [d]Includes data for acrylic, nylon, and other molding materials. [e]Includes data for epichlorohydrin, acrylic, silicone, and other protective-coating resins. [f]Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

DISPENSE MELTED PLASTICS *ACCURATELY* and *FAST*

To dispense many kinds of heated plastics, soft metals, resins, etc., a drop at a time or for continuous small flow, use the Sta-Warm "CNV" electrically heated compound dispenser. *Fast* acting, *easily* controlled.

Speed production. For special applications, variations of the "CNV" employ power agitators, overhead sling installation, bottom operated valves and similar modifications to meet your needs. All have thermostat controlled heat.

Write for catalog literature today



5 gal. model CNV melter with needle valve dispenser is one of 7 sizes in 2 qt. to 25 gal. cap.



"If You Can Wrap a String Around It, Sta-Warm Can Heat It for You."

Sta-Warm ELECTRIC CO.

858 N. CHESTNUT ST., RAVENNA, OHIO

Subsidiary of ABRASIVE & METAL PRODUCTS CO.

PRECISION CUTTING DIES by INDEPENDENT and NEW ERA

OK!



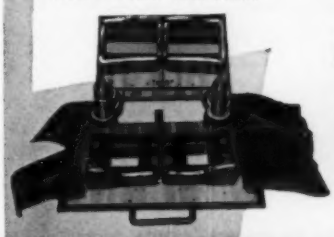
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MORE PROOF

ISOPHTHALIC RESINS

produce epoxy strengths at polyester prices



Continuing product application research by Oronite and resin suppliers shows new evidence of Isophthalic's superiority as a basic raw material in the production of reinforced plastics.

There is good evidence to show that Isophthalic-based plastics have greater initial strength and toughness and, most important, their strength and toughness under use conditions is considerably superior to other types of resin based plastics. This suggests much longer life and service for Oronite* Isophthalic based plastics.

Such a serviceable material which can meet your cost requirements opens up new horizons and new applications for reinforced plastic products, as well as offering improvements in present plastic products.

Just contact the Oronite office nearest you and see how Isophthalic can benefit your company's products.

Physical properties of Isophthalic polyester

	Isophthalic Polyester Laminate (High Isophthalic Ratio Type)	MIL R-7575-A Polyester Laminate Spec.	MIL-R-9300 A Epoxy Laminate Specification
Flexural Strength†— Ultimate, PSI	70,000 - 77,000	50,000	70,000
Modulus of Elasticity (X 10^6)	3.3 - 3.7	2.5	3.2
Tensile Strength† Ultimate, PSI	48,000 - 53,000	40,000	47,000
Compression Strength† Ultimate, PSI	47,000 - 52,000	35,000	50,000
Barcol†	60 - 65	55	60

†Using 12 plys of 181 Volan finish cloth laminated with Isophthalic polyester resin according to specification method

ORONITE CHEMICAL COMPANY

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*T.M.

4714



Less weight, more room in plastics van

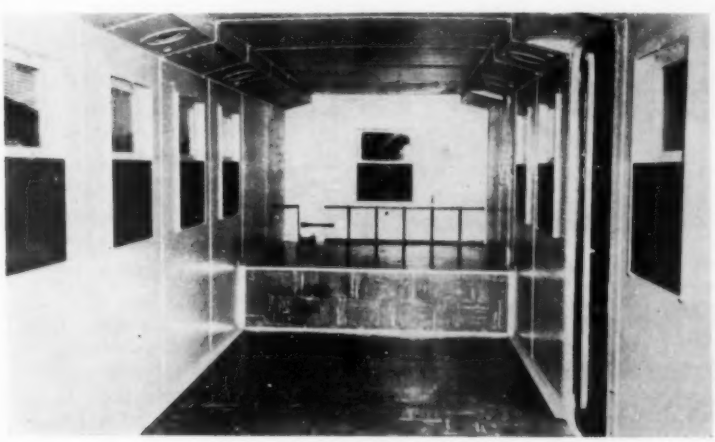
Efficient use of two plastics materials has made possible the development of a trailer that will carry 3000 lb. more payload than conventional vehicles of the same size.

Design of the Hupp Mobile Van, developed by Perfection Industries, Div. of Hupp Corp., Cleveland, Ohio, is based on a unique application of reinforced plastics and urethane foam. The 30-ft. trailer is constructed of sandwich panels made up of two sheets of fibrous glass-reinforced polyester resin with a polyurethane foam core. The panels are only 2 in. thick, yet supply insulation with a U-factor of 0.14—equal to more than 4 in. of conventional insulation. Because the thickness of the walls of the van is decreased 50%, interior carrying capacity is increased by 137½ cu. ft., providing 11% more load-carrying space.

The entire shell of the van—walls, roof, floor—is made up of the special panels, 4 by 8 ft. in size. These sandwich panels have a color-impregnated surface and never require painting. According to the manufacturer, the surface will resist water, salt spray, fungi, and weather, and will withstand continuous heat up to 350° F. indefinitely. The floor frame of the vehicle is made of 61ST aluminum.

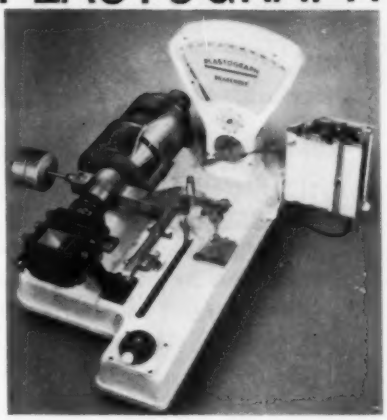
The Hupp Mobile Van measures 30 by 7 by 7 feet. Perfection Industries developed the vehicle as an airborne electronic equipment carrier for the U. S. Army Ordnance Dept. The van weighs just over 9000 pounds.

Adaptations of the vehicle will be made available for commercial and industrial use, the company announces. It is recommended for use where properties of excellent thermal and electrical insulation, light weight, flexibility, and rugged construction are required.



C.W. Brabender

PLASTOGRAPH



A Versatile, Heavy Duty Instrument for Recording Flow Properties of Plastics

DRAWS, before your eyes, the complete viscosity curve of plastic flow.

FORECASTS processing behavior at different shear rates and temperatures as high as 300° C.

EFFECT of various plasticizers, stabilizers, fillers and other additives is clearly defined. They may be introduced during any stage of the fusion cycle.

WE INVITE YOU
to come and bring your test materials. Let us demonstrate how the C. W. Brabender PLASTOGRAPH can be of invaluable help in controlling quality of raw materials and correcting processing difficulties.

• Write or call for technical bulletins.

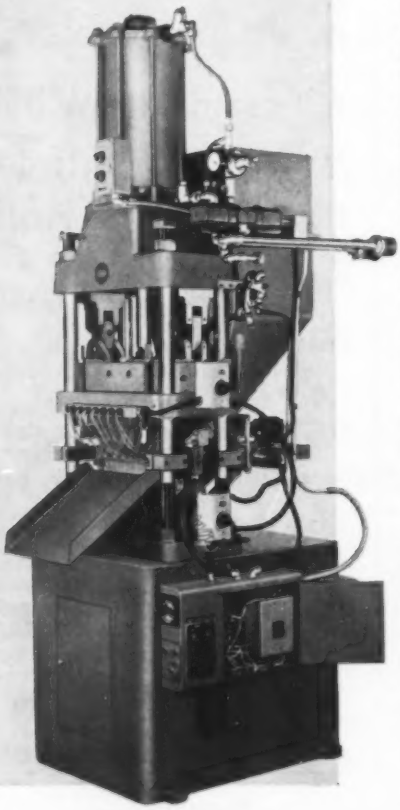
C.W. Brabender
Instruments, Inc.

(C. W. Brabender, President)
52 East Wesley Street, South Hackensack, N.J.
Diamond 3-8425
European enquiries should be addressed to:
Brabender O.H., Duisburg, West Germany

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HOW USERS PROFIT WITH AUTOMOLD COMPRESSION MOLDING MACHINES

"20¢ ...cost down to 7¢ per unit."
"...outstanding feature...simplicity of installation."
"...increased production rate 35%...improved appearance."
"Maintenance cost extremely low..."
"...PRODUCING 50,000 TO 65,000 PARTS PER DAY ON EACH MACHINE."
"...inter-changing molds eliminate costly gaps in production."



AUTOMOLD A308 automatic compression molding press

These quotes are an indication of Automold's outstanding qualities. Few, if any, automatic press manufacturers can make *all* these claims—and *none* of comparable capacity can match our *clincher:* the low first cost of Automold and its installation. As one electrical manufacturer said, "The cost of the die and the press itself was less than the cost of making a transfer die for our 200-ton transfer press." And then, "... the Automold press began producing parts immediately after being installed and set up for operation."

These presses, in 10, 25 and 50 ton capacities, are fully automatic, require only 100-120 lb. air supply, standard 110-220 V. circuits and small compact molds you can set up in less than two hours. Our revolutionary toggle power is dependable, easily maintained. And our engineers will test run your mold in our plant. You can't lose—so check with our representative in your area or send for his name and latest brochure.

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AUTOMOLD
AUTOMATIC MOLDING MACHINE COMPANY
Subsidiary of Wagner Brothers, Inc.



Squeeze tube bracket

A handy device for dispensing consumer products from plastic squeeze tubes is a simple new wall bracket molded of high-density polyethylene.

The device is designed especially for use with the polyethylene tubes made by Bradley Container Corp., Maynard, Mass. It will not work with metal tubes; with a flexible plastic squeeze tube the release of hand pressure creates a partial vacuum inside, which sucks the product back into the tube, keeping the opening clean at all times.

In use the tube is simply screwed into the threaded opening of the bracket in an upside down position. A squeeze of the tube dispenses the desired quantity of the product.

The wall bracket dispenser is manufactured in all popular thread sizes, and is attached to the wall surface by means of screws.

The high-pressure polyethylene material of which it is molded is tough, virtually indestructible, and inert to most chemicals. The bracket can be applied to a variety of products, such as hand creams, soaps, toothpastes, and similar items.

Credits: Developed and manufactured by the Sugar Beet Products Co., Saginaw, Mich., of high-density polyethylene supplied by Koppers Co., Pittsburgh, Pa.

Garan® Roving helps Amercoat* meet Rigid Specifications for Glass-Plastic Railing



Garan Roving-reinforced plastic railing at Del Mar Turf Club (California) withstands routine "bumping" from tractors—or horses—without buckling or damage.

Improved weathering characteristics and higher physical properties make this glass-reinforced plastic tubing ideal for many architectural uses—both exterior and interior.

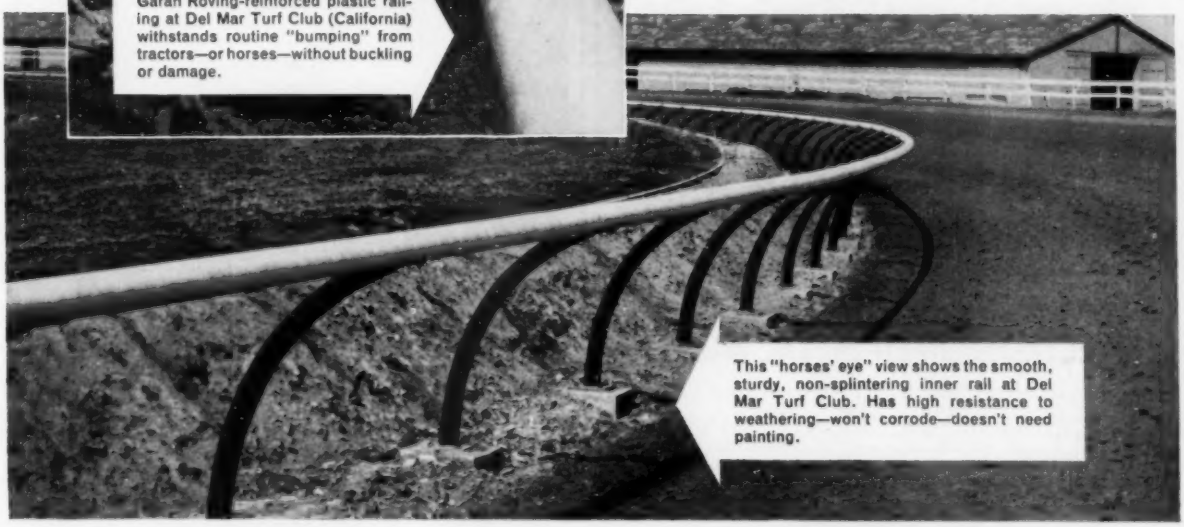
South Gate, California

found that Garan Roving met their exacting requirements in making tubing in diameters from 2" to 12"; with more strength than steel on a weight basis; unusually high flexural strength; lighter than aluminum; better weatherability.

Here's why Garan Roving did the job:

1. Faster resin wet-out... better bond... speeds production.
2. Improves flexural, compressive and tensile strengths.
3. High wet strength retention... adds durability.
4. Packaged for rapid, trouble-free pull out... cuts fabrication time.

Garan Roving, made by L·O·F Glass Fibers Company, is the quality reinforcement for preforming, corrugated sheet, rod stock, and woven roving applications.



This "horses' eye" view shows the smooth, sturdy, non-splintering inner rail at Del Mar Turf Club. Has high resistance to weathering—won't corrode—doesn't need painting.

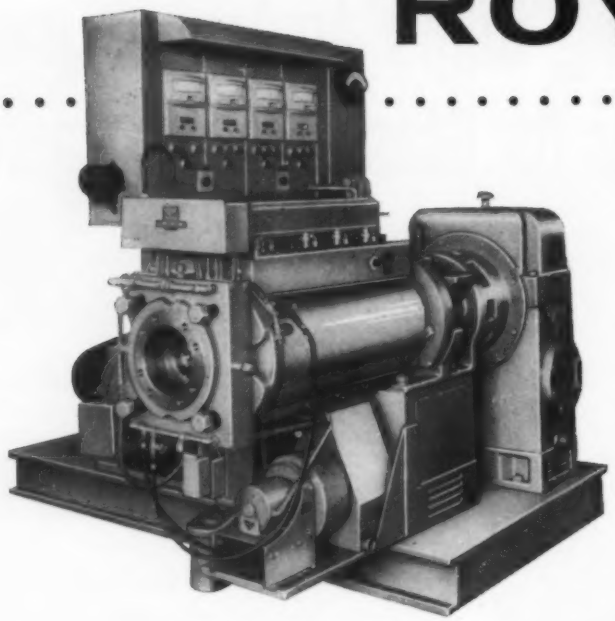
For technical information about Garan Roving and how it can improve your product, call our nearest sales office, or write: *L·O·F Glass Fibers Company, Dept. 15-38, 1810 Madison Avenue, Toledo 1, Ohio*

L·O·F GLASS FIBERS

L·O·F GLASS FIBERS COMPANY TOLEDO 1, OHIO

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SPIROD® EXTRUDERS



These all electric extruders with radiant heat and high velocity evaporative cooling are designed to process either plastic or rubber compounds. The result of more than three quarters of a century of experience — Royle pioneered the extrusion process in 1880— in the design and construction of extruding machines time tested features have been built into Spirod to assure dependability.

Write for Bulletin #463

JOHN ROYLE & SONS

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PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

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Vacuum-Formed . . . from

ELECTROFORMED METAL MOLDS

made by . . . T. V. Jay Company

This beautiful carrying case for the new TRAVLER Portable Phonograph is vacuum-formed by Cortland Industries, Chicago from electroformed molds made by T. V. Jay Company.

Using smooth stock, these electro-formed molds realistically reproduce the textured grain of leather in the normal forming operation.

Electro-formed Molds are fast cycling giving an exact reproduction of any textured surface. There's no chipping, cracking, hidden "blow-holes", etc. No additional polishing or finishing is necessary. Your vacuum formed samples may serve as patterns.

Write for complete data! Send blueprints for estimate.

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COIL FORMS from Short-Run Plastics

PRODUCED FROM OUR SPECIALLY DESIGNED PRESSES
¼" Dia. to 6" Sq.

SINGLE CAVITY MOLD COSTS START FROM $170.00

Materials:

- Fiberfil Nylon
- Kel-F
- Nylon
- Phenolics
- Plaskon Alkyd
- Thermoflow

Facilities:

Thermoplastic up to 8 ozs.
Thermosetting up to 150 tons

LET US QUOTE on your short-run plastic moldings. We will submit quotations without obligation.

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7K, MINNESOTA

Acrylic pistons

Reduced maintenance costs and improved operations of its line of filling machines have been achieved by Hope Machine Co., Philadelphia, Pa., by replacing stainless steel pistons with pistons machined from acrylic sheet.

The machines, which are used for filling containers with cosmetics, foods, medicinals, and other liquid or viscous materials, are equipped with pistons that measure out the volume of material going into the container; after measuring, the same pistons force the product through valves and nozzles into the containers being filled.

The switch from stainless to acrylic was made for several reasons. The most important was the fact that stainless pistons would cause score marks and scratches when rubbing against the stainless steel cylinder in case of O-ring failure. With the acrylic piston, no surface mars result.

Other reasons for going to acrylic included the following: 1) it is easily machined to desired dimensions; 2) its transparency makes checks on cleanliness easy—especially important when processing foods; 3) it retains its sharp edges during continuous operation; 4) it is light in weight and mechanically stable; and 5) its cost is only about ⅓ that of steel pistons.

Credits: Plexiglas acrylic sheet by Rohm & Haas Co.; machining by user (Hope Machine Co.)



Operator places fabricated cast acrylic piston in filling machine cylinder



Designed with the Look of Tomorrow by Raymond Loewy Associates

NEW PARTLOW MFS TEMPERATURE CONTROL

New Looks, Convenience, Efficiency for Your Process Equipment

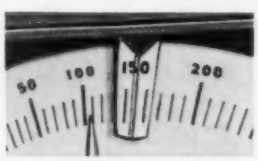
Striking as they are, good looks are only part of the story of Partlow's spectacular new control. Inside and out, the MFS is as rugged and efficient as a temperature control can be, its tough mercury-actuated element having been built to retain sensitivity and accuracy even under extreme conditions. Convenient, too! You can interchange the mercury element right out in the field . . . no factory adjustment is required.

The MFS comes in 10 scale ranges. Accurate within ½ of 1% of scale range, it is especially adaptable to control applications where temperature variations must be kept at a minimum; or where sudden temperature changes demand instant response.

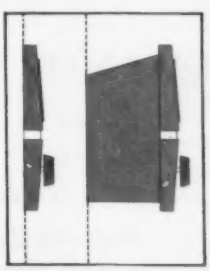
If your product or process requires close, positive temperature control within the –30° F. to 1100° F. range, you are invited to test this advanced new instrument soon. Write, wire or phone today.

THE PARTLOW CORP.
DEPT. MP-358, NEW HARTFORD, N. Y.

Only in the Partlow MFS so many important innovations:



Accu-Vision Dial — Magnified pointer for closest settings. Dial calibrations, pointers and background scientifically color-contrasted for easy readability — even at a distance.



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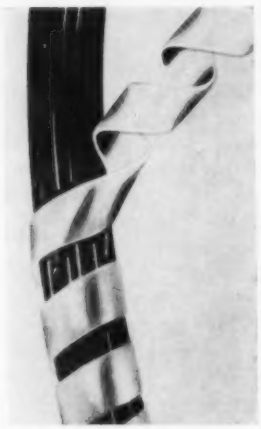
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Kleestron make a comprehensive range of general polystyrenes and impact materials — and will gladly supply technical details, prices, etc.

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The characteristic toughness, abrasion resistance, low surface friction, and excellent resilience of nylon are used to advantage in spirally-cut Polypenco nylon tubing, a new product with two distinct applications: for bundling tubing assemblies, and as an abrasion-resistant grommet.

In the first application—bundling tubing assemblies or insulated wire assemblies—spirally cut nylon tubing may be considered as a harness replacing other harness materials, such as friction tape, cord, cable clamps, or woven sleevings. After the tubing is positioned on the assembly, it can be slid along the axis of the assembly to relocate the bundling point as desired.



This characteristic makes the material particularly useful for the second type of application—as an abrasion-resistant grommet. Such grommets are usually injection molded and a separate die is required to produce each different diameter or length of grommet required. Since spirally-cut nylon tubing is expandable diametrically and is controllable in length by the amount cut from the reel, almost any size grommet can be obtained. The tubing is available in ⅛-, ¼-, and ½-in. outside diameters, and can be readily used to bundle diameters up to ¼-, ½-, and 1 in.

Credit: Polypenco nylon tubing available from The Polymer Corp. of Pennsylvania, Reading, Pa.

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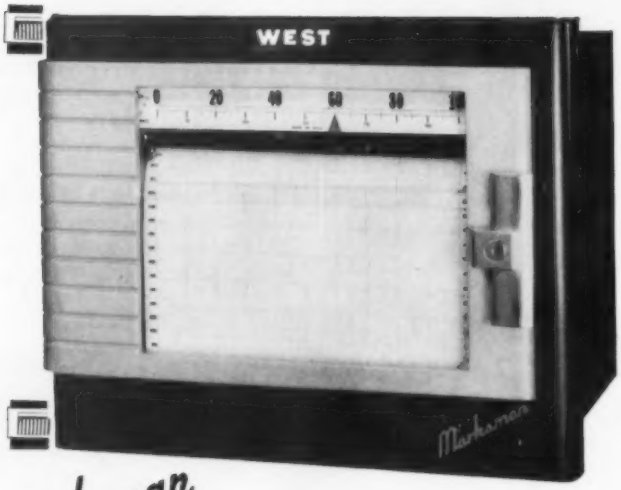
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Longest cast acrylic

Curtain wall panels of cast acrylic sheet are being used as exterior facing material by Wasco Products, Inc., on its new Cambridge, Mass., office building. The panels measure 144 in. long and are claimed to be the largest cast acrylic sheets ever produced. The panels were formed into the shape shown below before being installed to eliminate bowing, which would normally be associated with sheets of this size. The sheets are, of course, available flat. They are being produced clear colorless or white translucent in ⅛-, 3/16-, and ¼-in. thicknesses.

The panels were attached to the building over plywood sheathing in the following manner: A ½- by ½-in. acrylic bar was first cemented to the top flange of the panels and then inserted into an L-shape channel attached to the building. Each panel thus hangs from its top edge; effects of expansion and contraction due to temperature changes occur only at the bottom, which is free.

Panels are held in place by aluminum strips that are placed along their edges.

These panels have interesting possibilities in industrial and institutional construction; they also look good as materials for the outdoor sign field, especially when butt-jointed for large displays.



Acrylic curtain wall panel about to be installed over plywood sheathing. Sheets measure 12 ft. long, are produced by Wasco Products

IDEAS IN THE MAKING WITH
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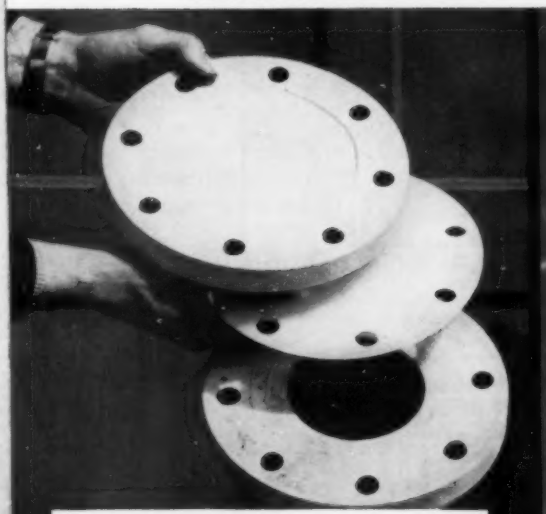
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Molding shrinkage

(*From pp. 117-122*)

of data for Diall 50-01 is shown in Fig. 21, p. 122.

Complete molding-shrinkage information, such as that given in Fig. 21, is useful to engineers in compensating for batch-to-batch variability of material or errors in mold design or fabrication. These data were obtained by using the most stringent control of molding conditions such as temperature, time, mold closing speed, etc. The standard deviation of the shrinkage factor for the data presented in Fig. 21 is 0.116 mil/in. for 300 degrees of freedom. This means that in molding Diall 50-01 over this range of conditions, the shrinkage factor F will be within ± 0.23 mil/in. of the value given by Fig. 21 about 95% of the time.

Precision of molding

The precision of molding obtainable in a part of simple shape under closely controlled conditions is valuable in evaluating the tolerances requested on new plastics part designs. Such information can serve to some extent as an ultimate level of the precision attainable with present-day molding processes.

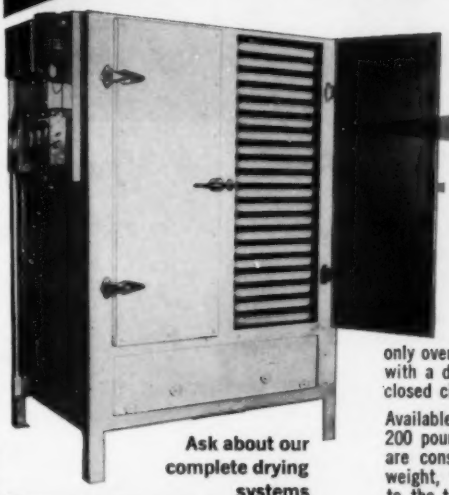
Precision of molding was determined as a by-product of the molding-shrinkage-factor experiments. In order to determine molding precision, it was necessary only to analyze the data statistically. The results of this analysis are shown in Table VIII, p. 122. These values represent the range in which 95% (or 99.7%) of the diameters of parts would be expected to fall. Of course, such parts would have to be made within the limits of molding conditions and with the process controls used here. These values do not take into account batch-to-batch variability, errors in mold design, fabrication, etc.

Many of these effects have already been recognized by skilled persons, and it is hoped that this study will not only provide them with a more thorough understanding of these effects, but will also be helpful to those encountering molding shrinkage problems for the first time.—END

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This unique design eliminates the handling of plastic scrap completely. The operator places the scrap into the grinder hopper. Virgin material is automatically removed from the material drum and mixed PROPORTIONATELY with the scrap as it is produced. Injection or extrusion hopper is maintained at constant level with completely blended material. Available in two models for beside-the-press applications—2A-3 with 7½" x 8" throat and 3C-2 with 10" x 12" throat.

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BLENDER-LOADER

The principle of the blender-loader is the same as the grinder-blender-loader except that it can receive the scrap discharge from an existing beside-the-press scrap grinder. It completely blends and accurately proportions virgin material and scrap and keeps the hopper full at constant level. It is also available in other models which will load and blend either two or four materials proportionately, removing the material from the containers automatically at the same time.

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Because of its proved durability, toughness, flexibility, chemical resistance, light weight and speed of installation, pipe made of Kralastic® has earned a unique position in the field of thermoplastic pipe.

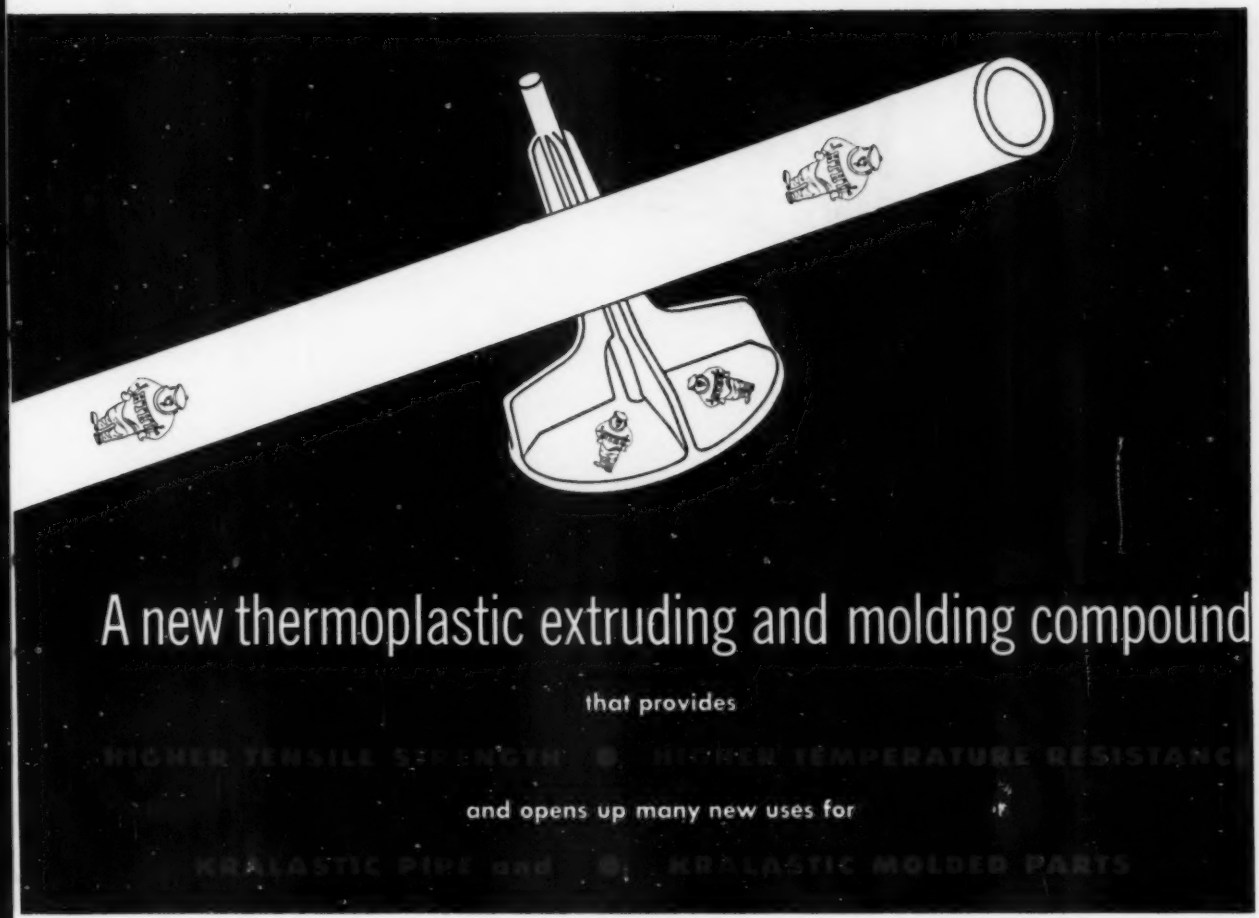
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- Handling corrosive liquids in paper, chemical, food-processing and water-treatment plants
- Conduit for electrical wiring

Not content with having produced the *best* pipe-extruding compound of its kind, Naugatuck's research and development chemists have been at work for some time on a



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compound having even higher tensile strength and capable of withstanding higher temperatures without distortion. Kralastic HTHT is the result.

Extensive new facilities for the production of Kralastic HTHT are now being completed. Meanwhile, limited quantities of the compound have been released to Kralastic extruders who have planned a new range of IPS and SWP sizes and ratings of pipe and fittings to take advantage of its greatly improved strength and temperature properties. These new lines of pipe make it possible for many new users to enjoy the economies and durability of Kralastic pipe in still more fields of application.

These advantages can be yours if you make certain that the plastic pipe you buy for high-pressure or high-temperature service is made of Kralastic HTHT. It's your assurance of satisfaction.

If you would like a list of pipe manufacturers using Kralastic HTHT... or if you are interested in its possibilities for your own production of extruded products or molded machine parts, write us today.

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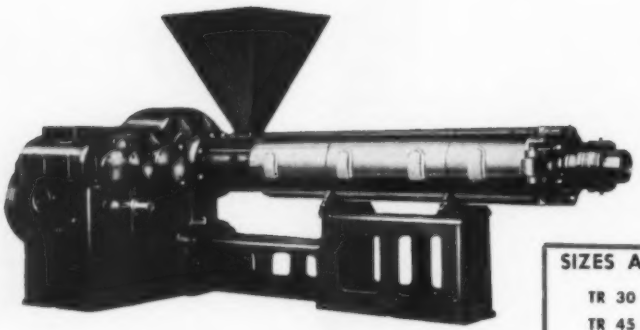
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Glass-reinforced

(*From pp.* 100-102)

eliminated in rigid grades; heat distortion (264 p.s.i.)—styrenes raised about 50° F., nylons raised about 300° F., polyethylenes raised to over 212° F. Naturally, these improvements in properties are only found where the dispersions of glass in the resins are properly made.

Dollarwise, the available glass-filled fiber materials offer more strength per dollar than most other available injection compounds. Take nylon for example: at the present time glass-filled nylon costs about one-third more than unreinforced nylon on a weight basis. Because of higher specific gravity of the glass-filled material, about 15% fewer parts will be obtained per pound of material bought. Even with this disadvantage, the balance is strongly in its favor.

As pointed out above, it has more than double the tensile strength, much more heat resistance, has *no* cold flow, and it molds to greater precision. Furthermore, with a modern machine and a proper mold, the molder can easily make 20 to 30% more parts per hour.

Molding conditions

First, these materials should be dried from 2 to 8 hrs. at 160° F. in ½-in. layers, according to the material. This step is particularly necessary with some color formulations where pigments may be hygroscopic.

In molding, the stock temperatures should be the same as for the same machine with the same resin without glass. The actual stock temperature should not be raised to assist in filling a mold. If such assistance is needed, the pressure and the mold temperature should be increased. But the cylinder temperature should not be increased.

Pressures required are some 20 to 25% greater for a given mold, so it is well to underrate the machine accordingly. The machine productivity will be more than regained because of the faster cycles.

Mold temperature comes in for more attention with this material

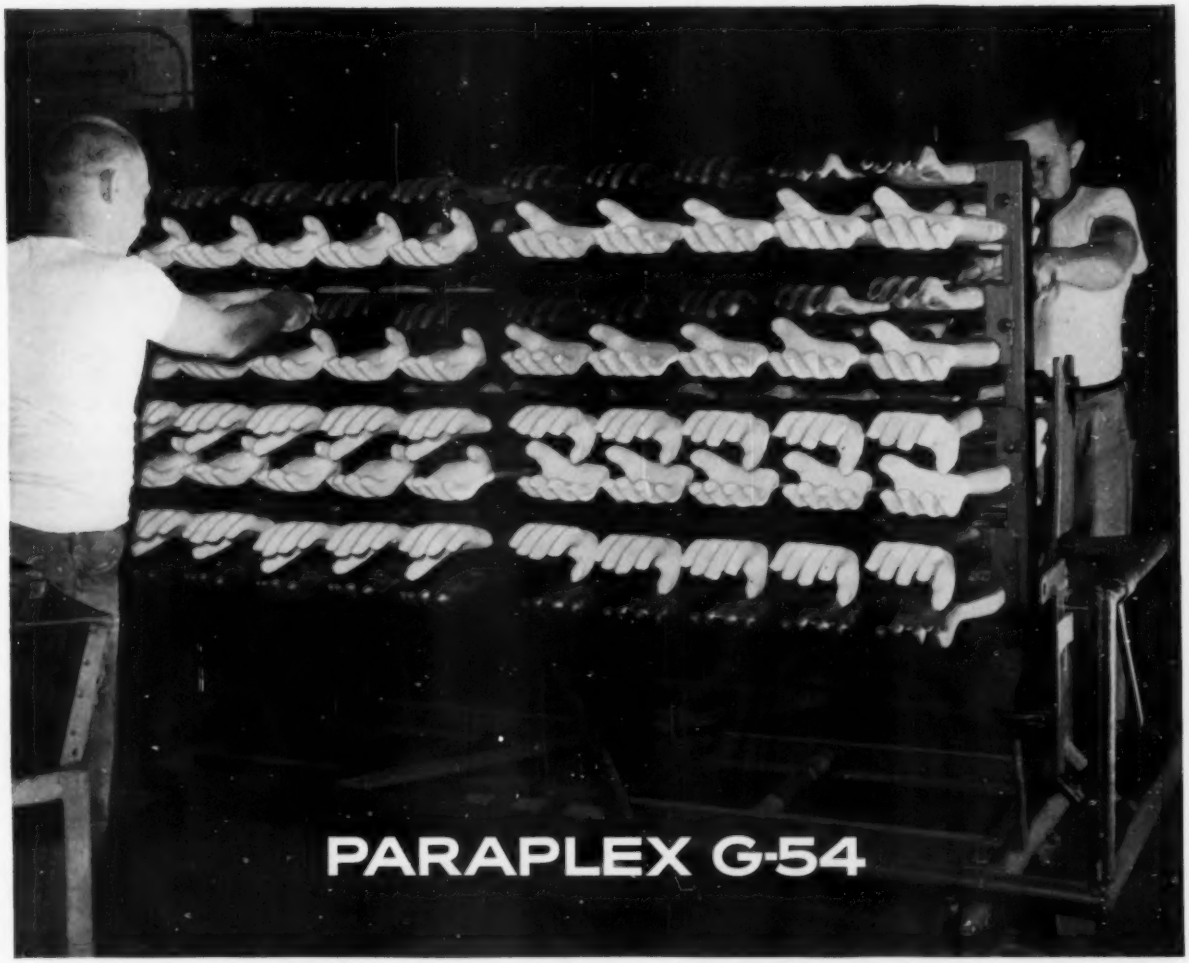


Photo courtesy Edmont Manufacturing Company, Coshocton, Ohio

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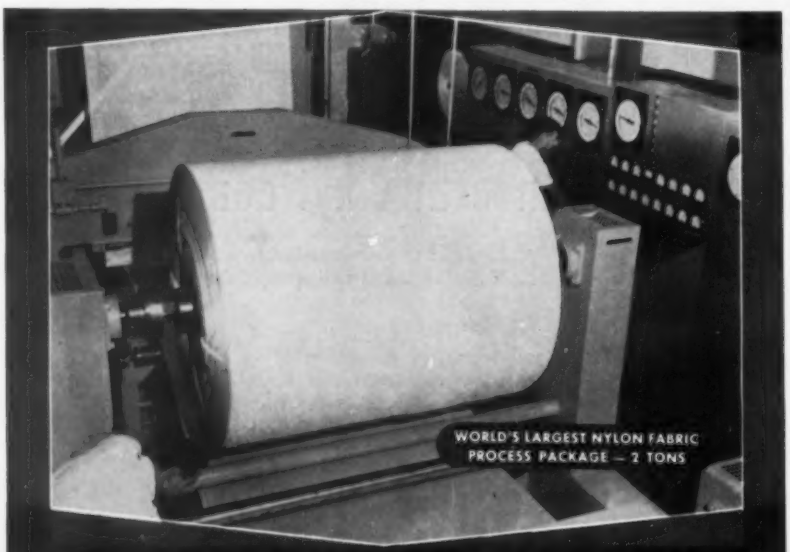
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than with most others. For one thing, it freezes rapidly. A mold surface temperature of 170 to 180° F. is a good starting point for high-finish articles with both GFF styrene and GFF nylon. The faster the injection, the cooler the mold can be and still maintain high finish.

Where finish is of no concern, a cooler mold can be run, but the fiber bundle orientation must be watched to be sure that the fibers do not fold or centerflow. The cavity should be filled by fast, turbulent flowing of molten material.

Gate location is important. The glass fibers are radially arranged at gates and do not interlock or felt. Gate points are somewhat like knotholes in a pine board, but it is believed that gates should not be located at critical points.

Shrink blocks can usually be dispensed with because these compounds set so rapidly. The machine operator will usually be so busy on the small and medium-sized parts that automatic degating and hot runners should definitely be considered. Shrinkage of GFF styrene is less than one-half that of general-purpose styrene and less still with GFF nylon.

Holes are best molded in—especially if they are for bearing purposes. In molded holes the glass fibers are wrapped around the hole and form a very good bearing; in a punched hole the fibers are cut and give a poor bearing.

Venting is especially important. Since GFF materials flash so little, ample venting is possible—even with nylon.

More to be learned

There are many problems still unsolved and much yet to be learned regarding these compounds. Why do some shops feel that ¼ to 5/16 in. is the maximum section that will give maximum strength while other shops can go higher?

What are the properties of other glass-content materials? What do other-than-glass fibers do when similarly compounded? These and many other questions are being studied.

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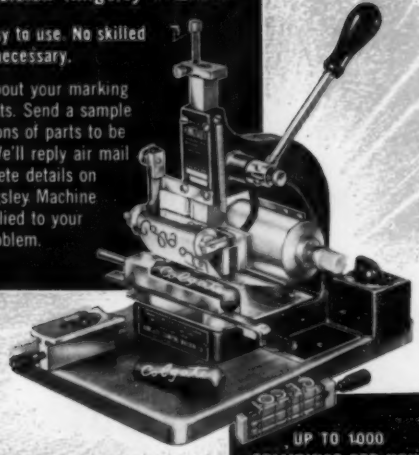
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The Loadbuster

(*From pp.* 98-99)

free of dust and other foreign matter which might produce hazardous tracking and arcing.

Four components of the Loadbuster are injection molded of ABS resin. The choice of this material was based upon its low coefficient of friction, high impact strength over a wide temperature range, excellent electrical properties, resistance to wear and abrasion, dimensional stability, and moldability to exacting tolerances.

Acrylic "smothers" arc

Functionally, the most unusual application of plastics in the Loadbuster involves the three acrylic parts, which are identified as the window, the liner, and the trailer. The liner and the window are injection molded of clear acrylic material, which is subsequently machined; the trailer is turned from transparent acrylic bar stock.

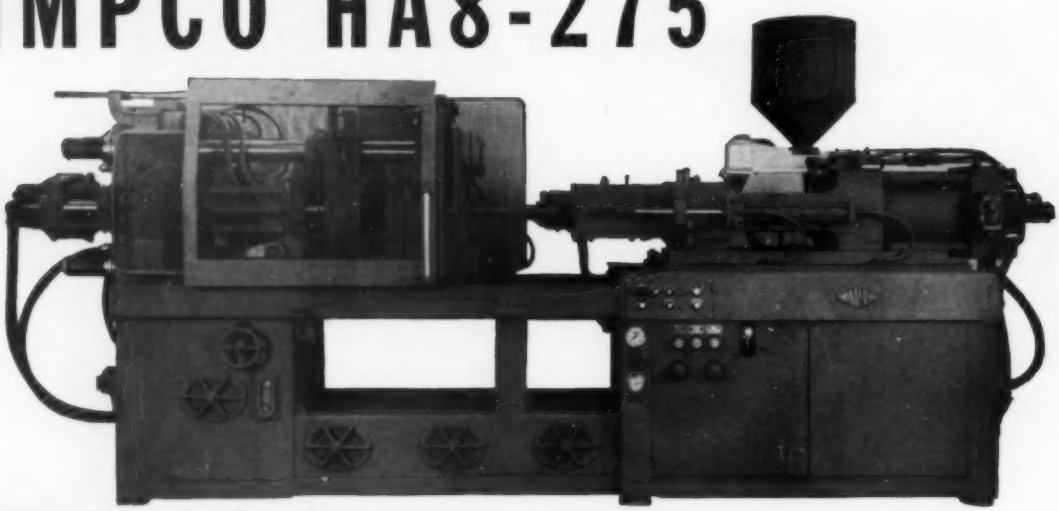
These plastics parts might be called the electrical heart of the Loadbuster, because through a combination of mechanical and electrical functions they actually "smother" the arc drawn when a disconnect or cutout is pulled open. To extinguish such an arc, it must be restricted in close contact with a suitable deionizing material—in this instance, acrylic. When the electrical contacts are separated within the Loadbuster, the arc is diverted through the narrow annular space between the trailer and the liner into which it fits. During this period of exposure, the acrylic parts yield deionizing gases which smother the arc. The exhaust gases produced by this action are cooled by a metal screen held in position around the end of the trailer by the molded acrylic window at the bottom of the tool. The exhaust gases escape through four radial vent openings drilled in the sides of the cap, minimizing the blast and directing it safely away from the operator. The flash produced is visible through the clear acrylic window.

The trailer hitch, which actuates the trailer and is enclosed within it, is fabricated from glass-reinforced polyester rod stock having fibers oriented in the lengthwise direction. This material is said to have high strength and the electrical properties are regarded as excellent.

In the course of normal usage, the trailer and liner are replaced periodically because of arc erosion. Based on typical usage conditions involving only occasional switching of heavier load currents, from 500 to 1000 operations may be expected between replacements.

Credits: Grade XX and Grade CE phenolic tubing, National Vulcanized Fibre Co.. Fibre Specialty Mfg. Co., Div., Philadelphia, Pa., and Glastic Corp., Cleveland, Ohio. Polyethylene components, Eltee Mfg. Co., Chicago, Ill., using Eastman polyethylene. Molded ABS and acrylic parts, Wilcox Products Co., Minneapolis, Minn., using Marbon Cycolac and Rohm & Haas Plexiglas molding materials.

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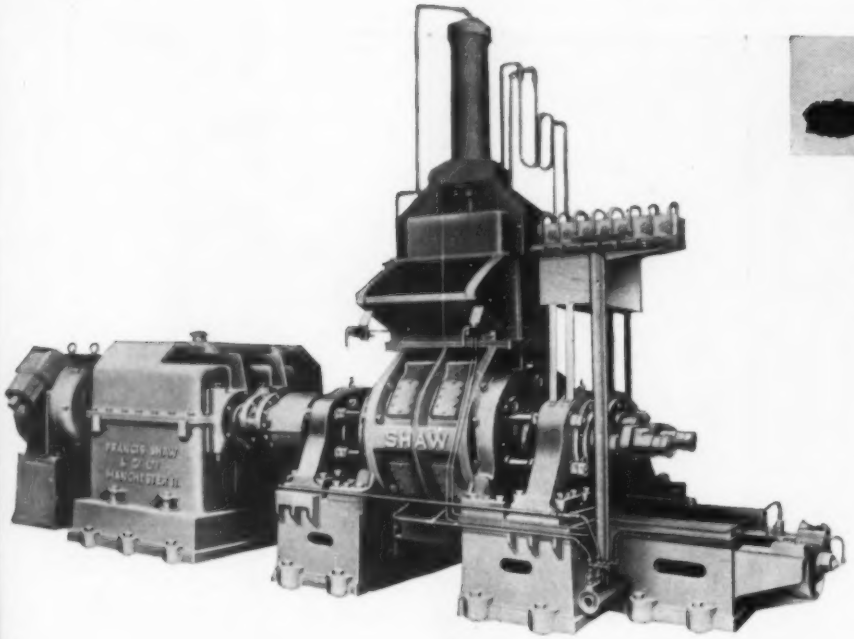
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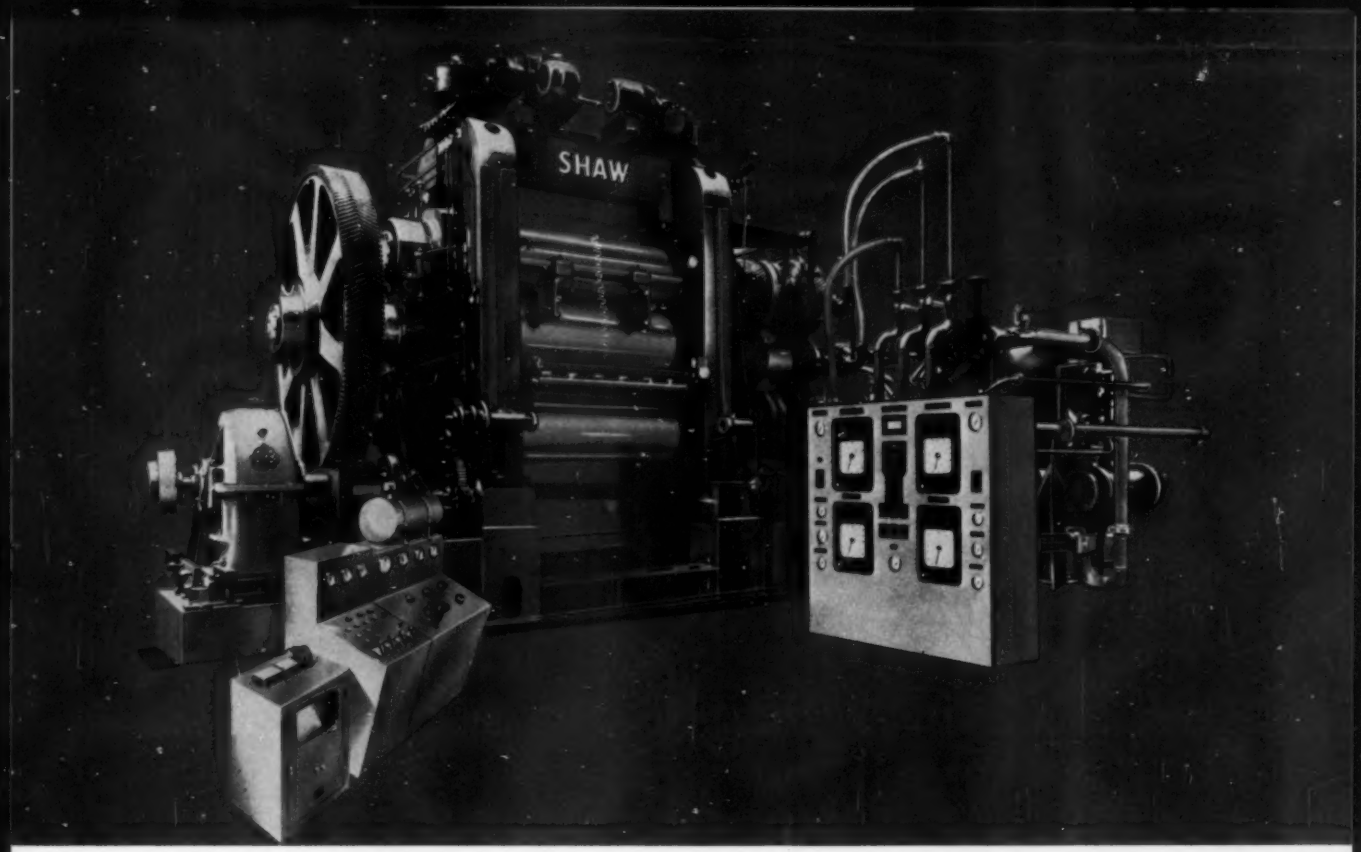
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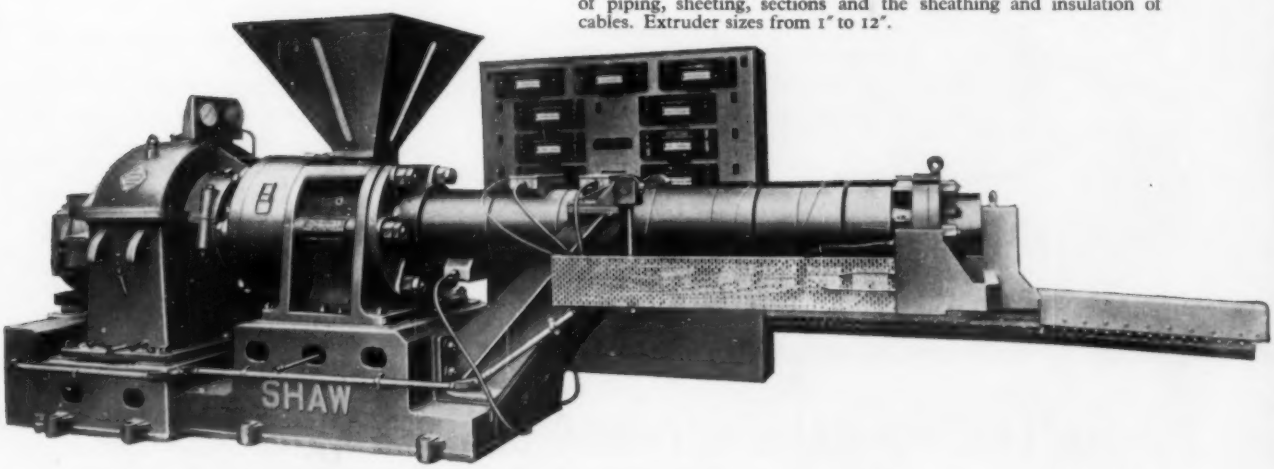


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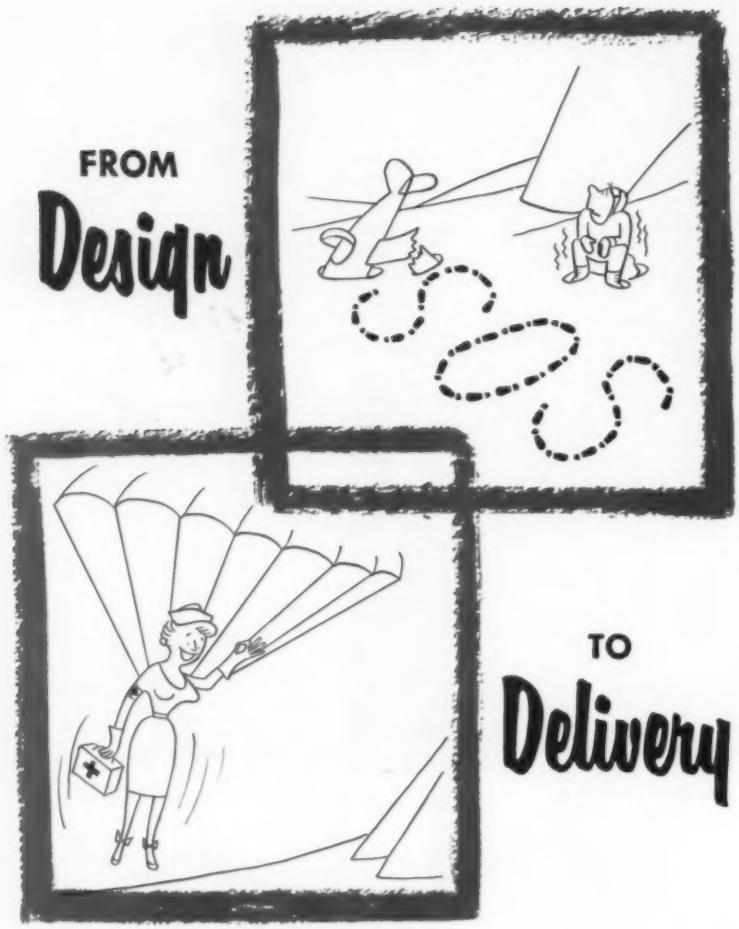
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(*From pp.* 134-142)

shown the beneficial effect of the presence of methyl methacrylate in resin compositions specifically designed for use with methyl methacrylate (P-444 in above data). It has also been shown that use of methyl methacrylate in commercially available resins results in marked improvement of performance. This improved performance is evident through better gloss retention, no surface failure, less yellowing, and better resistance to erosion and to what is termed fiber pop-out.

These conclusions are based on evidence up to three years' actual exposure. Even at this period, panels based on the optimum ratio of polyester/methyl methacrylate/styrene are barely showing signs of weathering; whereas standard resins using styrene alone are showing serious degradation.

It is believed by the authors that the work reported here represents the most important advance in polyester resins for use in exterior applications since the introduction of ultra-violet light stabilizers.

The authors acknowledge with gratitude the cooperative work of J. J. Gouza and C. G. Ramer in photography, L. A. Wetzel for gloss and color determinations, and R. W. Hart in solarization tests.

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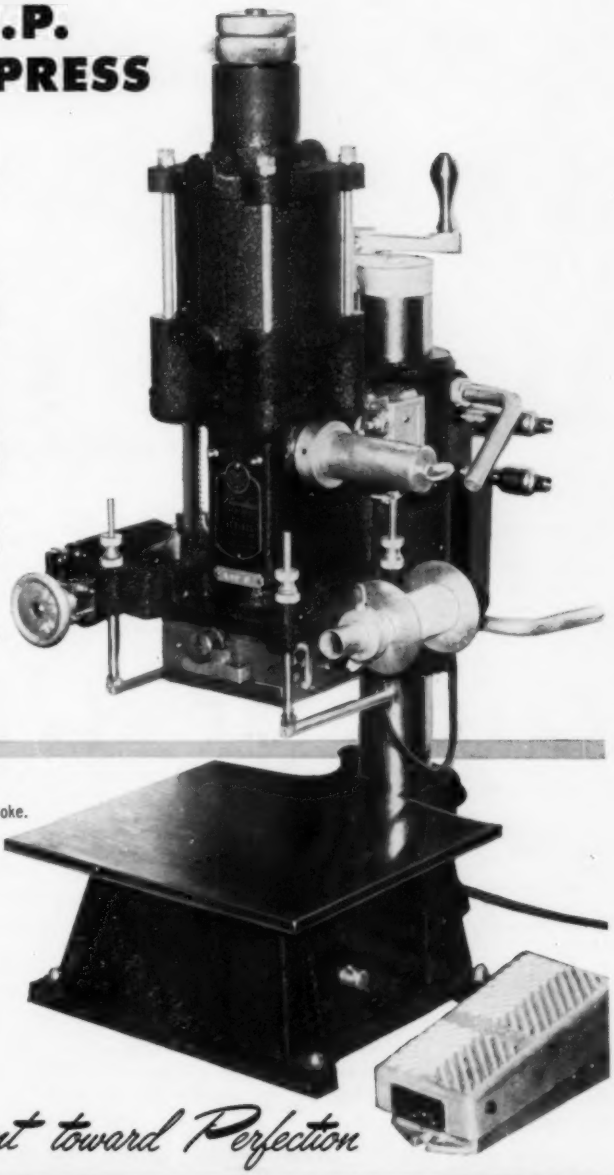
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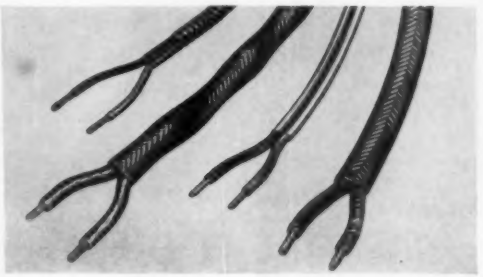
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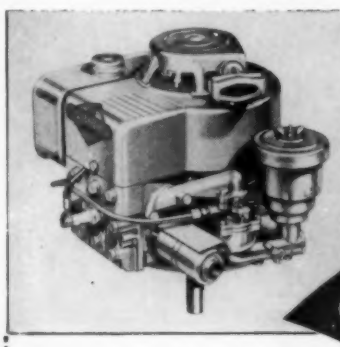
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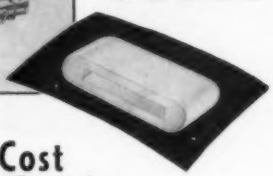
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Electronics

(*From pp.* 81-85)

duced by Polymer Corp. of Pennsylvania, Reading, Pa. Ferrotron materials are combinations of plastics and magnetic iron particles. The result has the fabricating versatility of plastics, plus the magnetic qualities of iron. One important use of Ferrotron tape is in small coils made up of alternate wraps of metallic strip and the tape. By using proper connections, the unit can be made to function as an inductor, filter, or a transformer.

Precision shapes

In the field of plastic molding and machined parts, the need is for simpler, more economical methods for creating prototype samples, without sacrificing accuracy or reproducibility.

New techniques are allowing Tri-Point Plastics, Inc., Albertson, N.Y., to machine Teflon insulating parts to tolerances approaching 0.001 of an inch. Such closely machined sections are required for flush antennas on high-speed aircraft.

Du Pont's new X-100 Teflon, while it lacks the original material's high-temperature resistance, will permit fabricators to mold Teflon parts by conventional thermoplastic methods. This is especially important considering the new emphasis on miniaturization.

Missiles and high-speed aircraft require extremely compact and lightweight guidance and control systems. In addition, microwave frequencies can be efficiently handled only if the leads between components are reduced almost to the vanishing point. In both cases, miniature components are the answer. But this only compounds the tolerance problems. In molding plastic spools for miniature inductors, for example, variations of a few thousandths of an inch can make important differences in the electrical characteristics of the finished part.

Plastic suppliers are hard at work developing special resins and compounds to meet these exacting requirements. One such material is a new modified poly-



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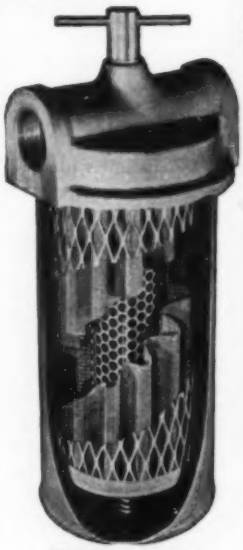
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The objective in the development of this material was to create a dielectric that will hold its electrical characteristics under extreme conditions of humidity and temperature, yet it can still be easily worked by conventional thermoplastic processing techniques.

New Look in printed circuits

Printed-circuits, now a volume market for plastic laminates, with at least a dozen custom fabricators operating highly automated production lines, are continuing to upset and change long-established electronics assembly practices and techniques.

One trouble with the conventional methods for making etched printed circuits is the danger of chemical deposits being trapped in the laminate or left on the surface. Such deposits can cause serious current leakage or even short circuits under high-humidity conditions.

The advantage of an etched circuit, on the other hand, over an embossed or stamped circuit board involving no chemical processes, is that the copper laminate can be applied under heat and pressure at the same time that the plastic laminate itself is being made. The result is extremely high peel strength, especially in the case of the new epoxy circuit-board laminates which require no intermediate bonding material.

International Business Machines Co. has developed a new technique of making circuit boards that involves no chemical processing or adhesives, and at the same time results in a flush-surface circuit. First step is to sinter a coating of copper or bronze powder onto a sheet of copper foil. This pebble-like surface then acts as an interlock when the foil is molded onto a plastic base.

IBM has been using a melamine, bonding it to the copper sheet in a conventional mold. The circuit pattern is created by raised lines in the face of the die. After molding, the lands between the de-

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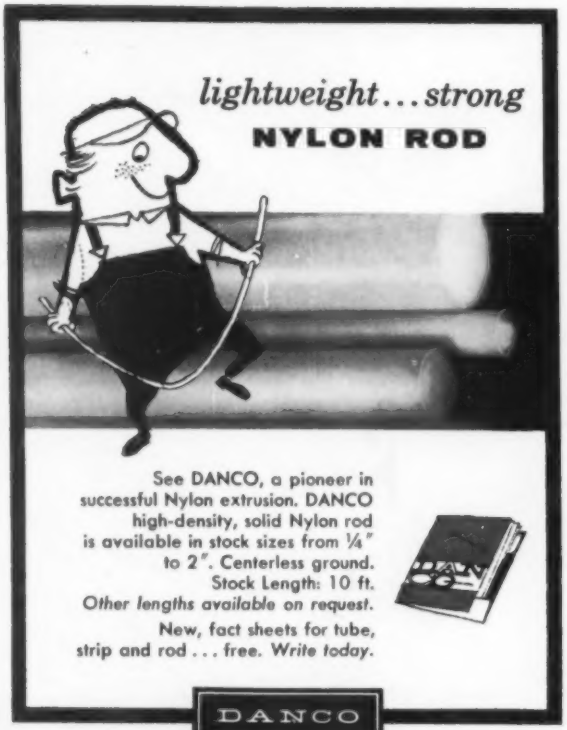
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Flexible cables, circuits, lights

Electronic packagers are adding a third dimension to the printed-circuit concept by using new flexible laminates for both circuits and cables. Formica, for example, offers a copper-laminated 0.008-in. film of epoxy resin and a fine-weave glass fabric which can be bent into tight radii without affecting the circuit reliability. Cubic Corp., San Diego, Calif., has developed a line of modular circuit elements based on such materials. Components are mounted and soldered on small squares of flexible printed circuitry. The entire circuit is then rolled up and inserted into a fiber cylinder with a vacuum-tube-socket base. A potting compound is poured into the center cavity to produce a solid, almost indestructible circuit unit.

Several companies have extended the same concept into the field of cables and cable harnesses. Tape Cable Corp., Rochester, N.Y., offers continuous rolls of polyester tape in which tiny parallel strands of copper foil have been imbedded. Nine standard tape sizes are available, with the number of conductors varying from 9 to 50. Each conductor has a cross section of 0.0015 by 0.030 in., and they are placed on 1/10-in. centers in order to facilitate the use of the cable with standard terminal strips and circuit elements.

Sanders Associates, Inc., Nashua, N.H., manufactures similar cables and circuits, using Kel-F and other sheet materials as a base. The conductors are made by a photo-etching process, and the finished units are sandwiches rather than embedments.

Still in the development stage, but with exciting potential, are the flexible plastic "lights" created by Westinghouse. (See photos, p. 85). Rayescent electroluminescent phosphors, which give off light when excited by an electric current, are coated on a nylon sheet or film. The potential efficiency of such a light source is higher than that of fluorescent lights, and plastic ceilings, walls,

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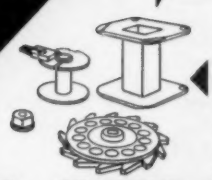
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Plastic coatings

An obvious way to apply plastic insulation to electronic components or systems is through spray or dip coatings, and presently a great variety of resins and techniques are being experimentally used. Dow Corning Corp., for example, has developed a sprayable grade of silicone. The material cures rapidly at room temperature, forming a cohesive coating over wires, components, and chassis. If a component is to be checked or replaced, the silicone coating can be simply slit and later patched with the same material. The silicone provides vibration damping at low temperatures, seals out moisture, and increases the surface resistivity of the circuit panel.

Epoxies, with their good adhesive properties, penetration, and rapid cure, are also obvious candidates for coating circuit panel boards. A number of modified resin systems for this work are now on the market, including formulations offered by Houghton Laboratories, Olean, N.Y.; Furane Plastics, Inc., Los Angeles, Calif.; and Emerson & Cuming, Inc., Canton, Mass.

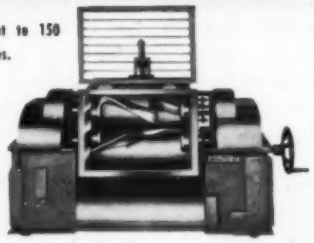
Polyurethane compounds are also finding increased use in electronic coatings, especially as wire enamels. The advantage here is that the resin disintegrates at soldering temperatures without leaving a carbon residue. (See photos, p. 84). No stripping or fluxing is required, therefore, and assembly and soldering can be put on an automatized basis.

Polysulfides, silicones, and vinyls also have their place in the coatings field, but the one group of resins that best typifies the extreme requirements of the electronics age is the fluorocarbons. They are not simple to apply, but their remarkable electrical characteristics, especially at high temperatures, make them outstanding for critical applications. One measure of how well the plastics industry has learned to work with the compounds is found in a Teflon-coated wire, on which the insulating layer is so

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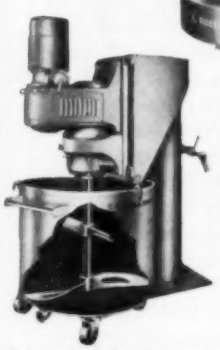
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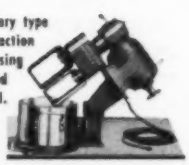
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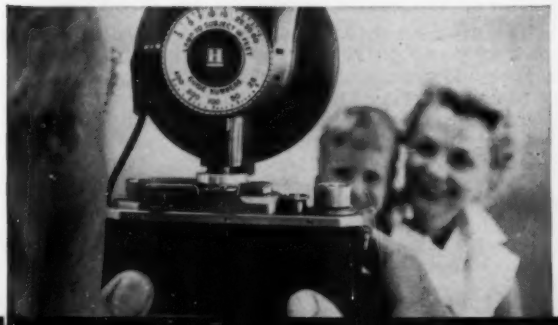
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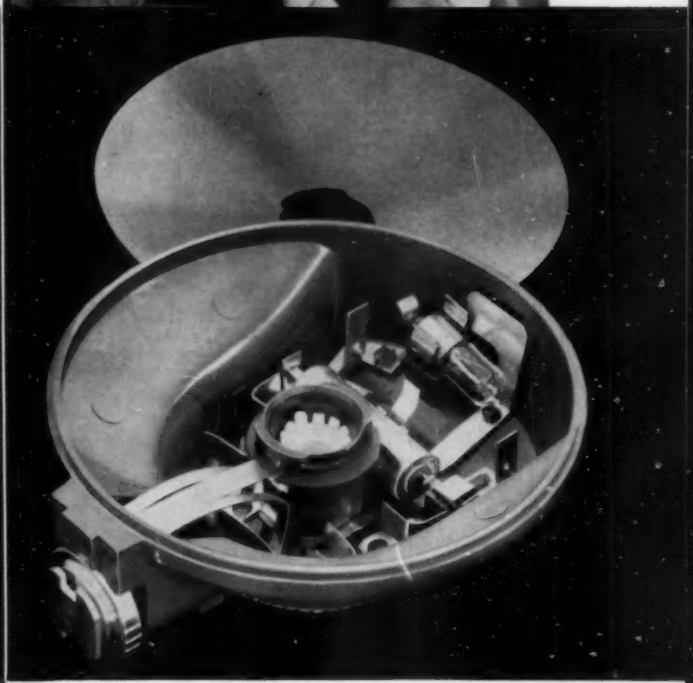
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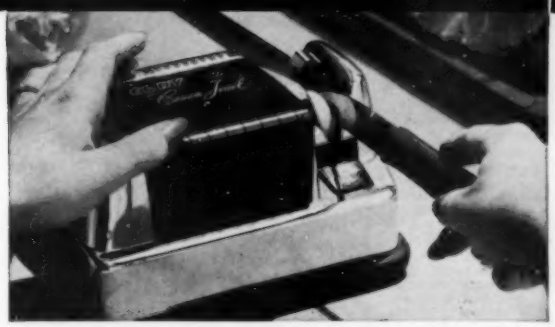
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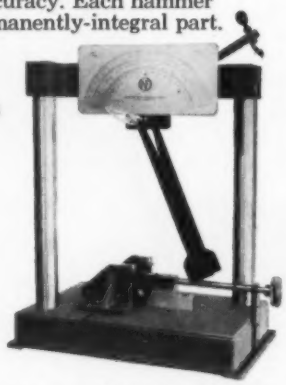
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A DOUBLE INSERT Part, automatically produced

For this IBM Brush Assembly, the core is die cast automatically and continuously onto 6 strands of music wire 3 on each side.

In the second cycle the nylon insulating jacket is molded automatically and continuously . . . right onto the die cast core and wire inserts.

Be sure to see GRC at the I.R.E.—**BOOTH 4042**

GRIES REPRODUCER CORP.

World's Foremost Producer of Small Die Castings
155 Beechwood Ave., New Rochelle, N. Y. • NEw Rochelle 3-8600

thin that important savings are made in weight and space. One such wire, produced by Thermax Wire Corp., New York, N.Y., has a Teflon wall thickness of only 0.004 to 0.007 in., yet has a rating of 300 volts. (See photo, p. 83).

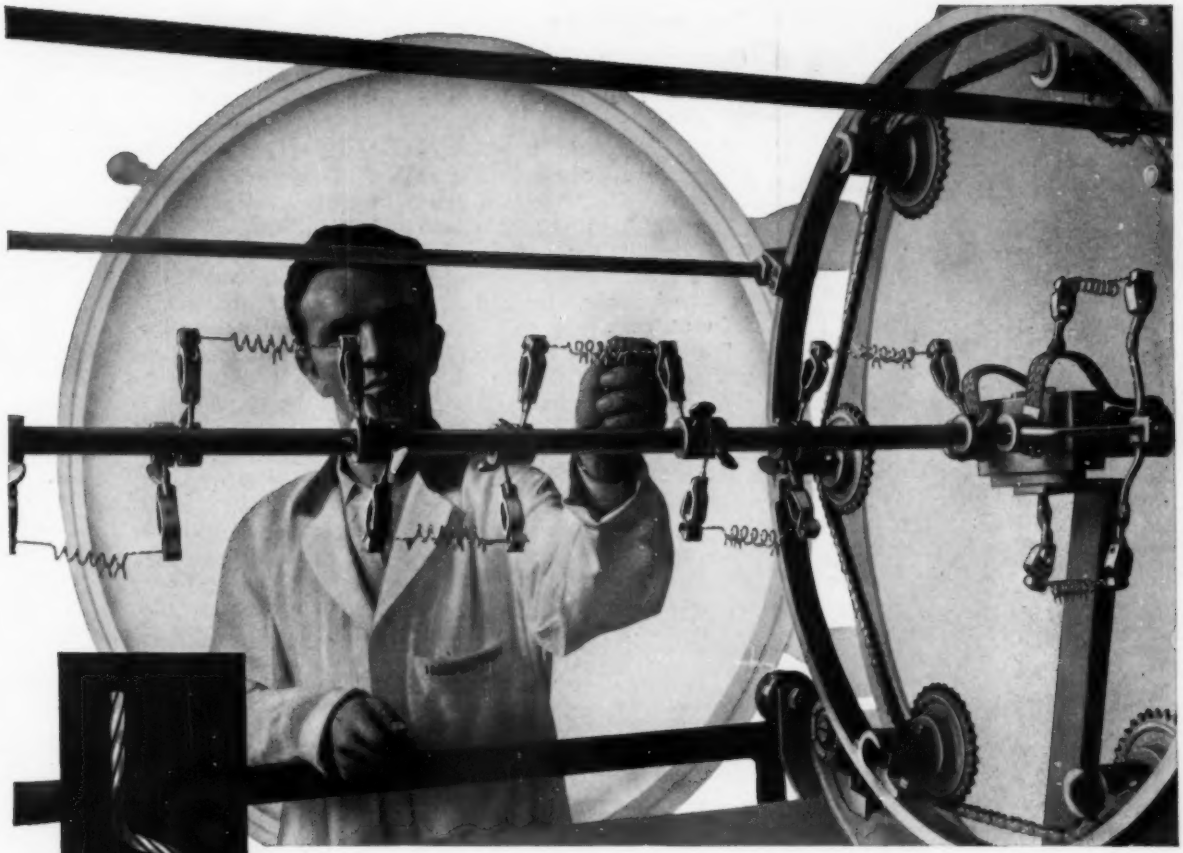
Sometimes the purpose of a plastic coating is not to insulate, but to conduct electricity. Alkyd, epoxy or silicone resins have been formulated with graphite, silver, or aluminum powders to permit the passage of electricity. Uses include heating elements, in which the entire coated surface acts as the heat source, or as a way to bleed off static charges. A silicone, filled with carbon black, has been tested as an electrical shield for silicone-insulated wire, and coaxial cables.

Potting with resins

The ultimate in protective insulation is, of course, to simply pot or encapsulate the entire assembly in a block of plastic. The move to this sort of protection has been hastened by increasing emphasis on plug-in subassemblies in most electronic systems. In case of failure, the entire unit is lifted out and replaced.

One feature of this field is that most of the customers are not plastic processors as such. Most electronic manufacturers prefer to do their own encapsulating. The emphasis has been, therefore, on simplicity. Epoxy Products, Inc., Irvington, N.J., for example, markets an "E-Form" pellet, a stable dry blend of epoxy and catalyst. No mixing is required. The pellets are simply poured into the cavity or mold, heat is applied, the material flows around the components, and cools to a solid mass.

Plastics foams make excellent encapsulation materials when vibration resistance or light weight are important considerations, and they are widely used in aircraft applications. Again, to keep the processing simple, Emerson & Cuming has introduced a line of one-component "pack in place" foams. The epoxy resin is simply used as received, packed or tamped into the cavity, and cured by heating. The finished foam has a uniform, fine structure, but a comparatively high density.—END





Looking for more "shots per dollar" in vacuum metallizing coils?

By switching to the best coil design, vacuum metallizers have realized as much as 30% more shots per dollar from Sylvania Tungsten Coils. Why is this possible? Because Sylvania helps vacuum metallizers find the right coil to do their job most economically. Whether you buy ready-made coils or form your own from tungsten strand, Sylvania is ready to help you get maximum efficiency.

If your metallizing process calls for a custom-made coil, Sylvania can recommend the best design consistent with the equipment you're using and the metallizing job to be done. In many cases, metallizers can get top efficiency from an existing Sylvania design, many of which have already become so popular they are considered standard.

Sylvania coils are formed of high-density tungsten strand manufactured to exacting standards of quality control. Sylvania Tungsten Strand is available in 3 to 7 ply with wire diameters of 0.020 to 0.600 inches per strand.

We invite you to write, outlining your specific requirements and problems. You'll find Sylvania is your best source for vacuum metallizing coils designed and built to offer "more shots per dollar."

Sylvania Electric Products Inc.
Chemical and Metallurgical Division
Towanda, Pennsylvania

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New York, New York
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New York, New York

Polyester film

(*From pp. 94-97*)

similarly treated to produce a Videne laminate.

Other potential stretch-laminate applications include unit packaging for cosmetics and pharmaceuticals; printed carton overwraps; pillow and fin type packages for dehydrated soups, powdered drinks, etc.; and rigid foil containers.

The new polyester film will perform satisfactorily in autoclaving operations, where a suitable heat sealable film has been sought for some time. It has been approved by the FDA for use with food; it is water resistant; and it has a relatively low moisture-vapor transmission rate. Conventional laminators are reportedly convertible to stretch laminators at a nominal cost.

Videne A film, produced with good gage control and reportedly pin-hole free, is offered in thicknesses from 2 to 7½ mils and in widths up to 54 inches; price is $2.25 per pound. At present, Goodyear is operating a fair sized production plant to produce both Videne A and TC films. Full scale production is expected by mid-1959, at which time a considerable price drop is anticipated. But even at the present price, film coverage cost for stretch-laminated Videne A is claimed to be competitive with other laminating materials.

American Duralize Corp., 261 Fifth Ave., New York, N.Y., a company now engaged in laminating various materials to Videne A by the stretch laminate method, is experimenting with the following products: synthetic fabrics, wallpaper, draperies, luggage, and business machine

Typical properties of

PHYSICAL PROPERTIES

Property	*Typical value*	*Gage*	*Test method*
Tensile strength, p.s.i.	8500	300	Instron tensile tester
Break elongation, %	4	300	Instron tensile tester
Impact strength @ 77°F., in.	11	500	Falling ball
Impact strength @ 8°F., in.	8	500	Falling ball
Burst strength, p.s.i.	60	500	Mullens
Tear strength, g./mil	8	500	Elmendorf
Fold life, cycles			Olsen M I T Fold
Clear	700	300	(1000-g. load)
Satin	350	300	
Abrasion, g./1000 cycles	0.0030	500	Taber CS-17 (1000-g. load)
Hardness, scale	80	500	Shore D
Index of refraction, nD-25°C.	1.70	—	Abbie refractometer
Density, g./cu.cm.	1.34	—	D G tube
Area factor, sq. in./lb./mil	20,060	—	Calculation

THERMAL PROPERTIES

Melting point, °F.	350	—
Softening point, °F.	180	R.C.A. heat distortion
Service temperature, °F.	—40 to 200	Cold cycle
Shrinkage @ 200°F., %	<1	—
Expansion coefficient, in./in./°F.	21×10^{-6}	—
Conductivity coefficient, cals./cm./sec./°C.	3.42×10^{-4}	Cenco-Fitch method
Olson flow, in./sec.	1.5/10	Olson 1000 p.s.i. @ 300° F.

ELECTRICAL PROPERTIES

Dielectric strength, v./mil., 25°C., 60 cycle (100 gage)	4500	ASTM-149
Power factor, % (1 kc., 25°C.)	0.75	ASTM-150
Dielectric constant (1 kc., 25°C.)	3.88	ASTM-150
Volume resistivity, ohm./cm. (25°C.)	$1.1\times10^{+13}$	ASTM-257

covers, a fiber-tube can that will hold liquids, expendable army tents with reinforced nylon scrim, and pork sausage wrappings with laminated scrim. Some of its customers are laminating the laminate i.e., they put together several layers of the Videne A scrim-laminate and then use it for a heavy wrapping material. Thicknesses of film for these applications can be varied from 0.0002 to 0.002 inch.

Another company, Di-Noc Chemical Arts, Inc., Cleveland, is using Videne A for background coating and embossing of ferrous and non-ferrous metals, hard boards, high-impact polystyrene sheet, leather and special papers.

Videne TC

To be available shortly in limited quantities, Videne TC has properties that are completely different from Videne A, since it is an oriented but not heat set polyester film. It is intended primarily for use as a shrinkable film for meat and poultry packaging. It is heat sealable. The price for 1000 sq. in. will be competitive with other shrinkable films.

Either a hot air tunnel or hot water dip as used on present shrinking equipment can to used to Videne TC. The film shrinks approximately 11% at 150° F. and approximately 33% at 160° F.

Its clarity is comparable with existing films used for the same purpose. It will withstand a falling ball test of 55 in. at 77° F. Tensile strength (length direction) is 8775 p.s.i. and 9245 p.s.i. transverse. Moisture vapor transmission rate is 3.07 in./24 hr. Gas transmission is 4.47 cc./24 hr./100 in.^{2} Oxygen transmission rate is 7.05 cc./24 hr./100 in.^{2}—END

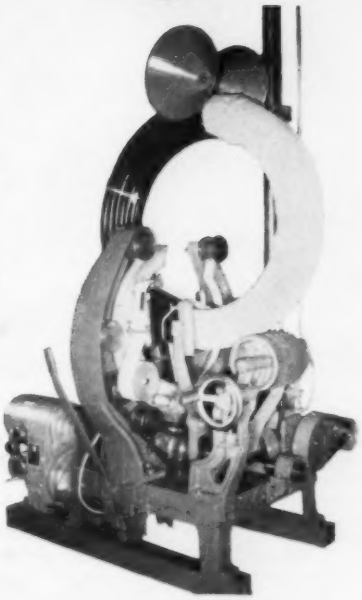
Videne A film

CHEMICAL PROPERTIES

Property	*Typical value*	*Test method*
Moisture vapor permeability, g./100 in.^{2}/24 hr./1 mil	2.25	General Foods tester
Air permeability, cc./100 in.^{2}/24 hr./mil	4.0	Packaging Inst. Test #4
Oxygen permeability, cc./100 in.^{2}/24 hr./mil	5.5	Packaging Inst. Test #4
CO_2 permeability, cc./100 in.^{2}/24 hr./mil	3.25	Packaging Inst. Test #4
Humidity coefficient of linear expansion, in./in./% R.H.	11.5×10^{-6}	20 to 92% R.H.
Fungus resistance	Inert	
Fadeometer, hr., no discoloration	500	Fadeometer
Weatherometer, hr., no discoloration	500	Weatherometer
Salt spray, hr., no discoloration	1000	Weatherometer
Copper corrosion	Negligible	Visual
Absorption		24 hr. immersion
Water, %	0.5	@ 77° F.
Ethyl alcohol, %	0.2	"
S A E oil, %	1.5	"
Gasoline, %	0.1	"
Carbon tetrachloride, %	1.0	"
M.E.K., %	2(Swells)	"
Diethyl ether, %	3.5	"
Benzene, %	6(Swells)	"
Aging, 1 year	No discoloration	Florida exposure
1 year	No discoloration	Arizona exposure
Chemical resistance, 1 year	Excellent for weak acids and bases	

New Pierce JHW-2 Hose Wrapper

STOPS HOSE DAMAGE IN TRANSIT



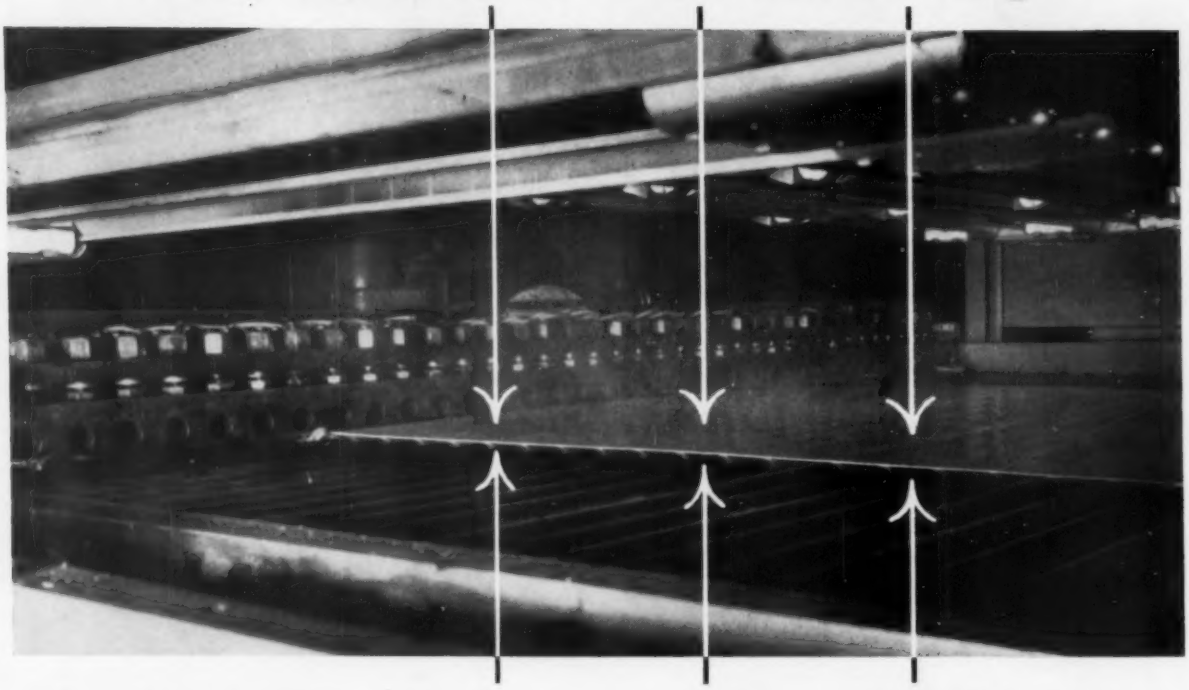
Now you can end hose handling headaches with this new Pierce Hose Wrapping Machine.

- Ideal for wrapping cumbersome coils of plastic or rubber hose.
- Automatically makes a tight, continuous spiral paper wrap—each layer firmly glued to preceding layer.
- Greatly reduces damage in shipment—practically eliminates scuffing, scratching, gouging, cutting, tearing.
- Protects quality—hose arrives in clean, factory-fresh condition.
- Speeds packaging operation—saves time and labor.
- Available with automatic printer for imprinting along periphery of wrap.
- Available on outright purchase or lease arrangement.

Write or wire for full details

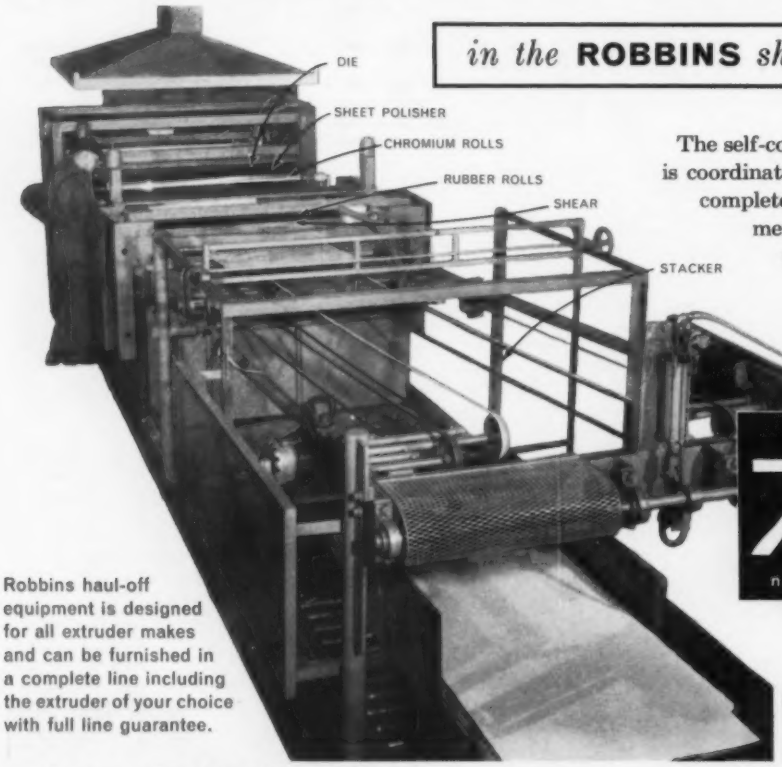
PIERCE WRAPPING MACHINE COMPANY
1100 E. 31st Street • LaGrange Park, Ill.

we heat it on the top



and cool it on the bottom

in the **ROBBINS** *sheet polishing unit*



The self-contained Robbins Sheet Polisher is coordinated here with other units in the complete line of Robbins haul-off equipment. Write for particulars on how the Robbins Sheet Polisher cuts costs, produces a uniform product, retains finish after vacuum forming.

Robbins haul-off equipment is designed for all extruder makes and can be furnished in a complete line including the extruder of your choice with full line guarantee.

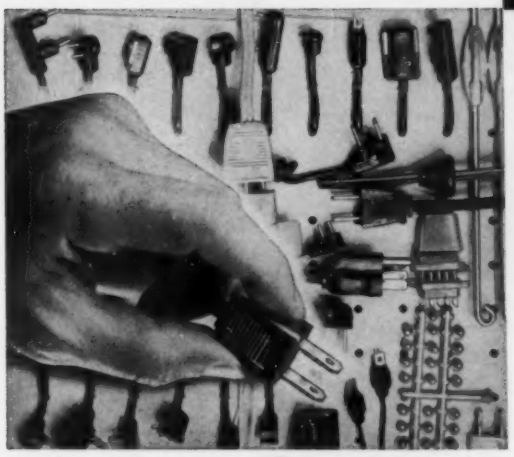
Robbins
never say die . . . say Robbins die

PLASTIC MACHINERY CORP.
Subsidiary of Lynch Corp., Anderson, Ind., U.S.A.
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from die to sheet stacker **ROBBINS** engineered and **ROBBINS** built

MOLD 'EM QUICKER* BETTER* FOR LESS* on . . .





MINI-JECTOR cuts costs for manufacturers of electrical, electronics, industrial, and commercial equipment. Wide variety (above right), MINI-JECTOR produced, represents major savings in big-press tooling where not required. Electrical and electronics parts (above) made for less on MINI-JECTOR: plugs, cord-ends, antennas, miniature brush ass'ys, slip rings, etc.

MINI-JECTOR®

Reg. U.S. Pat. Off.

PLASTIC INJECTION MOLDING MACHINES

***Quicker:** Produce thousands of molded items before "big-press" tooling is off design board.*

***Better:** Award-winning quality and precision even in complex, "insert" molded designs.*

***For Less:** Develop and produce molded items at fraction of "big-press" tooling costs.*

You can save *actual thousands* in mold costs alone with MINI-JECTOR! (Mold-blanks as low as $29.50.) Others are doing it—avoiding big-press "high-per-piece" tooling expense where not required.

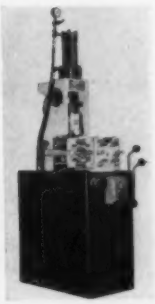
Only MINI-JECTOR offers so many exclusive features:

- **. . . for quicker, lower-cost development and steady, moderate production of variety small (1/3 oz. to 1 oz.) plastic items in all thermoplastics, including Nylon.**
- **. . . for quick design changes; and running thousands of perfect market-test samples.**
- **. . . for specialty items and plastic molding over inserts—from intricate electronic parts to baits, novelties, etc.; marketed quicker.**
- **. . . for laboratory and educational test-sample design and production—quick thousands of perfect parts in variety of colors. No lost changeover time.**
- **. . . for short or moderate runs—too costly on big-presses—profitable on MINI-JECTOR.**

***Send for FREE Catalog*—Detailed, illustrated, complete. Engineering data and specifications on entire low-cost MINI-JECTOR line of plastic injection molding machines and accessories. Many features superior to most expensive machines. Shows how MINI-JECTOR helps you develop and produce 1/3 oz. to 1 oz. molded plastic items more profitably than by other methods.**



NEWBURY INDUSTRIES, INC.
Box 391, Newbury, Ohio



New, Low-Cost "UNIVERSAL" Super-Hornet

- ★ **More Features**
- ★ **More Versatile**
- ★ **More Flexible**
- ★ **More Economical**

The new, *all-in-one* UNIVERSAL! Combines all the best features of the *four* most popular MINI-JECTOR models in a *single machine*. Molds interchange. Use either full-area, straight-block "Hornet" molds for conventional production; or wedge-block "Wasp" molds for special insert work and encapsulating. Ideal for developing and producing widest variety of small injection molded parts; from precision miniatures to full size, single-cavity items up to one ounce. Never before so many features at such low cost. Get full details.



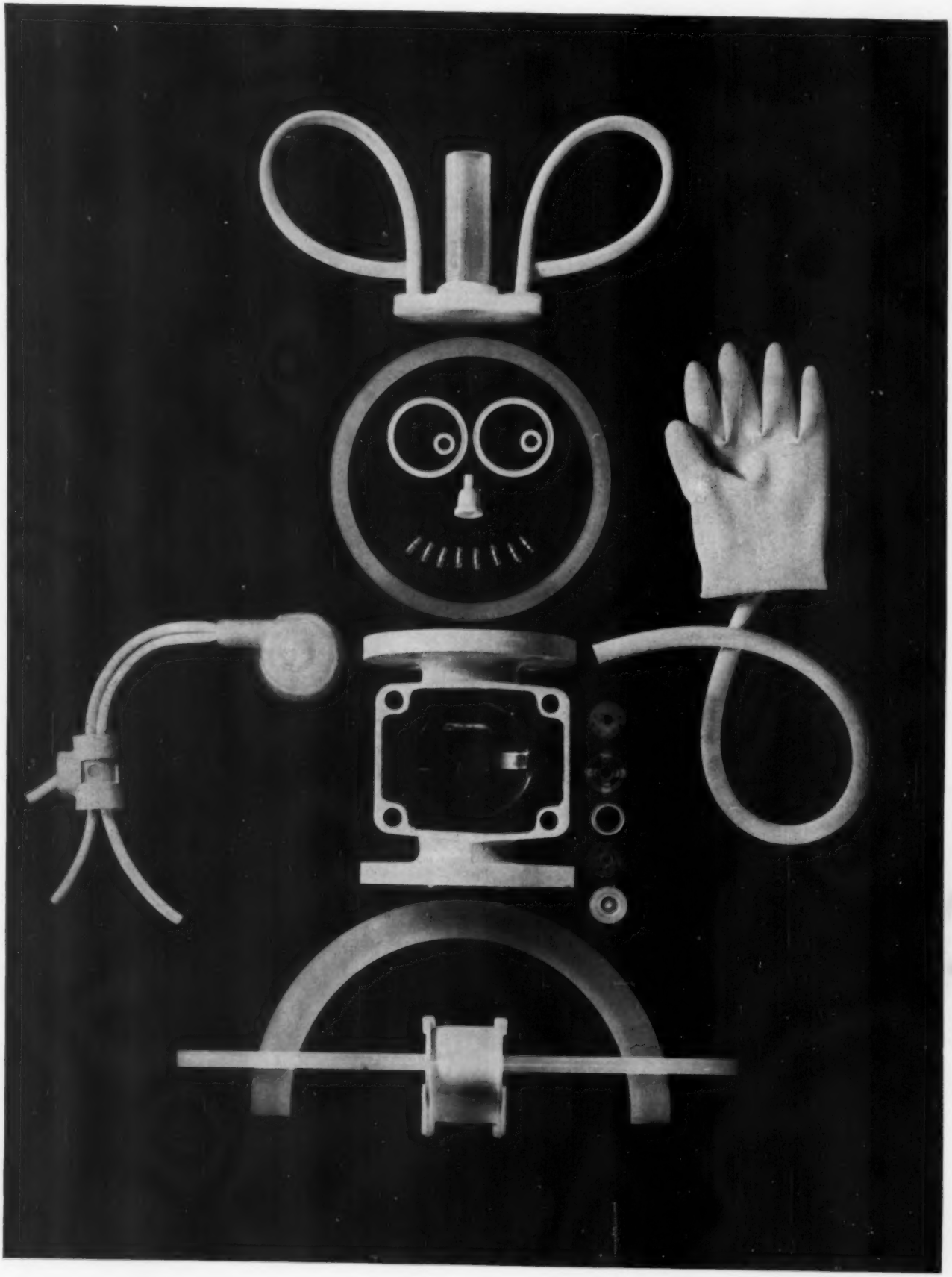
Model 60 Super "Hornet"
Hydraulic-operated, lever-controlled.



Model 43 "Wasp" (bench)
Air-operated, lever-controlled.



Mod. 55 "air-JET" (Wasp) Push-button controlled



3M Chemicals opening new worlds of use for plastics

STOPS corrosion by violent acids, caustics, organic solvents, oxidants

KEL-F® PLASTIC

3M TRIFLUOROCHLOROETHYLENE POLYMERS

The life expectancy of the gentleman at left is virtually unlimited!

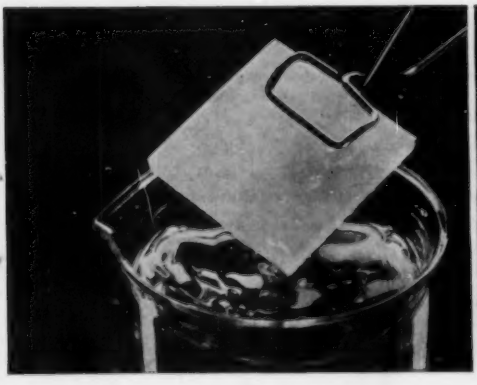
Each component is fabricated from KEL-F Brand trifluorochloroethylene polymer. KEL-F halofluorocarbon products are outstanding in their resistance to chemical attack, cold, heat, moisture. And they possess superior electrical properties, as well!

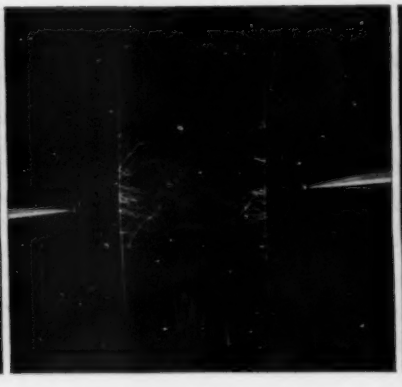
What's more, KEL-F can be compression-, transfer-, or injection-molded on standard equipment. It can be extruded into tubing or wire insulation, and KEL-F dispersion can be readily applied to most surfaces by conventional methods. The result: The final cost of plastic products fabricated from KEL-F is drastically reduced . . . compared to those produced from perfluorocarbons.

KEL-F molding resins are available in a number of high and low-density grades. All exhibit the same remarkable versatility—the result of KEL-F's unique combination of chemical, electrical and mechanical properties. Cost-wise . . . performance-wise—these resins are making a whole new generation of plastic applications possible.

Investigate KEL-F halofluorocarbons—resins, dispersions, elastomers, laminates, alkanes, oil, waxes, greases and chemicals—as the most economical means to lengthen the life of your product or equipment in electrical, chemical processing and many other operations. For free literature giving complete data, write: *3M Company, Dept. WU-38, St. Paul 6, Minnesota.*









EXCEPTIONAL CHEMICAL STABILITY! After seven-days immersion in either 37% hydrochloric acid, 90% hydrogen peroxide, 98% fuming nitric acid, 95% sulphuric acid, or anhydrous ammonia, weight change at 25°C reads 0.0%.

HIGH DIELECTRIC STRENGTH: short time 1/16"—530 v/mil. Extremely high-volume resistivity: 10^{18} ohm-cm at 50% relative humidity and 25°C. Arc resistance > 360 sec. Proof of superior electrical performance!

EXCELLENT THERMAL STABILITY! Wide temperature range (—320°F to +390°F) without any resulting material decomposition, or any mechanical failure. KEL-F displays zero-moisture absorption; is readily molded.

Jersey City Chemical Division • Chemical Products Group

MINNESOTA MINING AND MANUFACTURING COMPANY

. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY CHEMICALS

✓ CHECK THESE FEATURES

of the Improved Model 75—4 ounce

MOSLO PLASTIC INJECTION MOLDING MACHINE



In order to meet the needs of plastic molders, Moslo engineers have incorporated many improvements in their line of plastic injection molding machines. These refinements provide even more efficient, trouble-free operation with a greater profitable return to molders. At right are listed a few of these improvements:

- All machine limit switches are **PLUG-IN** type. These switches plug in as easy as a radio tube; can be replaced in 20 seconds; eliminating hours of costly down time.
- Press control operation is timed by Microflex timers located in electrical control cabinet (not illustrated above). These timers with **PLUG-IN** features and Micrometer type dial assure dependability and accuracy.
- **PLUG-IN** heat pyrometers are standard equipment.
- New modified J.I.C. control circuits arranged for 115 volt, 60 cycle control makes possible greater safety and standardization for easy maintenance.
- Additional valving on manifold for injection unit increases overall machine efficiency.
- Improved self-compensating feed mechanism.
- Nylon tubing assures long life for automatic lubrication system. In addition, protective features greatly reduce possibility of contamination of finished part.
- Refinements on clamp linkage improve operation.

These are only a few of the improvements built into the Moslo Model 75, 4-ounce Machine. Write for complete details or we will be glad to have a sales representative call at your request.

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▲
Polyester resin is poured into cured fiber glass preform in the mold of the press prior to molding finished product. Uniformity of Pittsburgh Fiber Glass Roving makes products strong and durable, keeps rejects low, saves money.

"We cut rejections in half, produced better plastic products with Pittsburgh Fiber Glass Roving"

—says Mr. Robert E. Mollman, Production Manager, Plastic Products Corporation, Bedford Heights, Ohio

"The consistent uniformity we obtain from Pittsburgh Roving enables us to produce quality flower boxes, jardinieres, bird baths, mail boxes and laundry tubs that have fiber glass reinforcing through and through, especially at the corners," reports Mr. Mollman.

"When we began manufacturing three years ago, we tried a variety of fiber glass roving. Lack of roving uniformity from ball to ball caused a high rejection rate. But through this trial period, we discovered that Pittsburgh Type 610-60 Fiber Glass Roving produced more uniform preforms and permitted us to make strong and durable products. Using Pittsburgh Roving exclusively reduced our rejection rate very substantially.

"The dimension uniformity of Pittsburgh Roving is consistent from shipment to shipment. As a result, our operations are more profitable, we fulfill our obligations to customers and we make more efficient use of our materials."

HAVE YOU TRIED PITTSBURGH ROVING?

There's a type of Pittsburgh Fiber Glass Roving that's just right for your reinforced plastic operations. We'll be glad to help you get uniform results by working with you right in your own plant. For technical assistance, call your nearest PPG Sales Office, or write direct. *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.*

PITTSBURGH ROVING IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh and St. Louis

75th ANNIVERSARY 1883—1958 PPG

SYMBOL OF SERVICE FOR SEVENTY-FIVE YEARS

PITTSBURGH PLATE GLASS COMPANY

The Plastiscope

News and interpretations of the news
By R. L. Van Boskirk

Section 2 *(Section 1 starts on p. 37)*

New grade of Plexiglas

Unshrunk cast methacrylate sheet, designated Plexiglas G, is being produced by Rohm & Haas Co., Philadelphia, Pa. The new grade is priced 2¢/sq. ft. lower than the company's standard commercial sheet, Plexiglas R.

The material is said to provide maximum flatness for applications that do not involve forming, such as glazing, and to possess uniform shrinkage for uses where sheets are silk screened or cut to size in the flat before forming.

To allow for shrinkage when the new sheets are heated and formed by processors, Plexiglas G sheets are supplied untrimmed in sizes 2.5% longer and wider than the corresponding sizes in preshrunk Plexiglas. Thicknesses of 0.060 to 0.250 in. are offered in colorless transparent and in colors.

Sheets with patterned and matte-finish surfaces are also available in extra-large sizes from 72 by 120 to 102 by 120 inches. Designated Plexiglas GL, these sheets are priced 8¢/sq. ft. lower than the equivalent sizes in heat-treated Plexiglas RL.

Awards for informative labels

Grand prize for the best informative label of 106 entries from 45 companies, identifying plastic consumer products during 1957, was awarded to Federal Tool Corp., Chicago, Ill. The award was based on two product labels: Rainmaster sprinkling can and the Silent minnow pail. William T. Cruse, executive vice president of The Society of the Plastics Industry, Inc., presented the award at the semi-annual luncheon of the S.P.I. Plastics Housewares Manufacturers Div. at the Hotel Sherman, Chicago.

The two Federal labels also won individual category awards—the Rainmaster sprinkling can label won the Hardware award, and the Silent minnow pail label, the Sporting Goods award.

Additional awards in four other categories of plastics products were made to Alpha Plastics, Inc., American Cyanamid Co., The Plas-Tex Corp., and North Star Industries, Inc.

Progress in phenolic foam

Economies of phenolic foam over conventional thermal insulation materials to protect utility service inlets from weather damage were highlighted with a recent on-the-spot demonstration at the Research Home program of the National Association of Home Builders at Kensington, Md. The materials and techniques employed were developed by Bakelite Co., Div. of Union Carbide Corp.

Actual installation of the foam was made several months ago. Ten cubic feet of foam were used to insulate a sewer pipe, water service pipe, and electrical inlet. Of this volume, about 55% of the foam extends below the frost level, protected from excess ground moisture by a vinyl film used to line the hole.

The ability of this phenolic formulation to foam at the relatively low temperature of 65° F. enhances its possibilities as an insulating material. Low thermal conductivity, fire resistance, and foam-in-place manufacture represent advantages to home builders.

Field tests have been conducted by the company for a number of years on such installations as the insulation of an entire home, a laboratory cold room, and a refrigerated trailer truck. Current evaluation of these projects indicates satisfactory performance of phenolic foam as a thermal insulation.

New anti-static compounds

Four forms of a new coating compound for neutralizing positive and negative charges on the surface of plastic materials have been announced by Optics Mfg. Corp., S. E. Cor. Amber & Willard Sts., Philadelphia 34, Pa.

Called Opta Stat with AS 88, all four forms are chemically inert, are declared not to discolor, and are not harmful to any plastic. Applied to a surface capable of accepting a static charge, the compound forms a rough non-tacky film, completely transparent and of high dielectric strength. This film is rigid, resists normal wear indoors and outdoors, and is not affected by heat up to approximately 450° F.

The four forms are liquid, cream, paste, and (as AS 88M) a mold release agent which renders die surfaces static free. One wipe treatment will last for from 6 to 12 shots.

No form of AS 88 will leave a smudge or haze because a cleaning agent is incorporated which leaves the treated surfaces sparkling. Tested to date on phonograph records, recording tapes, thermoplastic and thermoset moldings, and thermoformable sheet, as well as on vinyl-coated fabric, these anti-statics are reported to have functioned satisfactorily.

Toy design competition

Molders, extruders, fabricators, and proprietary manufacturers of polystyrene and polyethylene toys can participate in the 1958 Design Competition for Plastic Toys, sponsored by Koppers Co., Inc.

Summer camps for handicapped children will benefit to the tune

° Reg. U.S. Pat. Off.

News about R&A SINCE 1913 **Adhesives**

FOR ALL METALS AND ALL PLASTICS

New, easy-to-spray "panel" adhesives speed drying, cut costs . . .

- *Yield high strength bonds in all types of panels*
- *Permit swift, sturdy bonding at room temperature*
- *Feature outstanding heat and water resistance*

New R&A "sandwich" panel adhesives – such as BONDMASTER G580 – combine faster drying speed with improved spraying characteristics. As a result, you not only enjoy much faster and smoother area-coverage-per-gallon but cut assembly-time costs substantially.

Other new adhesives, (BONDMASTER G592, for example) were formulated to bond at room temperature and can be combined virtually instantaneously. Nevertheless, they still incorporate the easy spray-ability that makes them ideally suited for desk-top work and similar applications where both good strength and flexibility are the targets.



One quick squeeze . . . and the panel is bonded!

WHERE ASSEMBLY IS DELAYED

For specialized panel assemblies where maximum flexibility and longer "open time" are the key requirements, products like BONDMASTER G544 may be combined for room temperature bonding as long as 6 hours after spraying (or as soon as 10 minutes afterward if speed of assembly is essential).

HOT OR COLD BONDING OF ALL FACES, ALL CORES

There are almost as many different ways to bond "sandwiches" as there are types of assemblies . . . and end-uses.

Generally speaking, the type of equipment available, the end-use service conditions, and the price limitations of the completed panel determine the choice of adhesive.

Since we manufacture formulations for the bonding of just about every type of panel produced today (paper, wood, plastic, or metal cores and/or faces) we're in an exceptional position to help you solve *your* specific adhesives problems.

Write for technical data on the full range of BONDMASTER "sandwich panel" adhesives. Better still, send for our detailed Problem Analysis Form so that you can outline your problem fully for our best and most current recommendations.

Where solvents are "taboo" . . .

Frequently, certain panel components . . . or the end-use service conditions . . . or your available manufacturing facilities . . . demand the use of 100% reactive adhesives.

For example, where one surface is a relatively soluble thermoplastic (such as polystyrene in rigid sheet or foamed form) there is often a need for a solvent-free adhesive that can provide sturdy bonds without heat or pressure. This is particularly true where a greater degree of structural load-bearing is involved ("specialty" canopies, skylights, etc.).



Similarly, a special approach is called for when the bond is expected to withstand unusual temperature extremes (such as the 250°F and over in some military structures) or where resistance to acids, strong alkalies, solvents, etc., is needed.

For such specialized applications, it will pay you to investigate R&A's 100% reactive, solvent-free BONDMASTER epoxies and PLYMASTER dry film adhesives. Detailed technical data upon request.

R&A SINCE 1913

RUBBER & ASBESTOS CORPORATION

243 BELLEVILLE AVENUE
BLOOMFIELD, NEW JERSEY

The Plastiscope

of $5000 from the competition. This amount will consist of five first prizes of $1000 to winning molders in each of five classifications. These winners will receive from Koppers a list of accredited summer camps for handicapped children in the United States. The camp selected by the molder will then be given a $1000 grant by Koppers in the molder's name.

Dr. Frances Horwich of TV's "Ding Dong School" heads the panel of judges. Others on the panel are Dr. Jesse H. Day, editor of the *S.P.E. Journal*; and William M. Goldsmith, president of the American Society of Industrial Designers.

Although this is the fourth annual plastic design competition sponsored by Koppers, it is the first one designated for toys. The three preceding competitions were for plastic housewares. Hereafter, the company will alternate toys and housewares annually.

All product entries, with accompanying entry forms, must be submitted to the Administration Committee before midnight, April 10, 1958. Entries should be shipped, mailed, or delivered to Administration Committee, Koppers Design Competition, 950 Koppers Bldg., Pittsburgh 19, Pa.

Nylon molding powder reduced

National Polymer Products, Inc., a subsidiary of The Polymer Corp., Reading, Pa., has reduced prices approximately 18% on its Nylatron GS nylon molding powders. Lots of 5000 lb. and over have been reduced from $1.55 to $1.28 per pound. The company states that the price cut was made possible by operational economies, higher volume production, and lower costs of the basic polyamide.

Nylatron GS is a molybdenum disulphide-filled type 6/6 nylon formulated for nylon molded parts. The material is said to have a higher modulus of elasticity, higher heat distortion temperature, and better wear resistance than nylon 101. Molding reports indicate in many cases that the lower thermal expansion and dimensional stability of Nylatron GS have provided better tolerance parts with less distortion after molding.

Catalin sales increase

Company sales for Catalin Corp. of America in 1957 rose approximately 10% over 1956 to about $24 million, and net earnings 20% over the previous year, according to a statement by Harry Krehbiel, president.

Among the new Catalin products at least partially responsible for last year's increased sales volume are new antioxidants for vinyl chloride cable coatings which have been developed in the company's new laboratory and pilot-plant facilities.

Lightweight PVC pipe fittings

A line of lightweight injection molded pipe fittings of unplasticized PVC is being produced by Tube Turns Plastics, Inc., 2929 Magazine St., Louisville 11, Ky. According to the company, the fittings will match the burst strength of Schedule 40 PVC pipe and will cost about one-third less than its regular line of standard heavy wall (Schedule 80) industrial fittings. They will be made of both normal and high-impact materials with the same characteristics of corrosion resistance, non-aging and easy, low-cost installations as the heavier fittings.

Laboratory and field tests are reported to show that PVC pipe with these solvent-cemented, socket-type fittings can stand up under 20% greater operating conditions than threaded joints, and provide unimpeded flow which ranges up to 20% higher than can be expected from conventional piping.

Wide applications of the fittings are expected wherever moderate pressures and temperatures permit the use of the lighter weights, particularly for low-pressure crude oil and natural gas transmission lines, salt water disposal lines in petroleum fields, and water piping systems where salt, hardness, ionization, or other factors pose severe corrosion problems.

Thermoforming machine distributor

A recent announcement from Conapac Corp., 120 E. 13th St., New York, N. Y., states that it has been granted the exclusive distributorship in the United States and Canada of Formvac and Formpac machines for Hydro-Chemie, Inc., Zurich, Switzerland.

Hydro-Chemie produces an extensive line of machinery for the thermoforming of plastic materials for both packaging and industrial applications. Its methods of "air slip" forming were described in MODERN PLASTICS, Feb. 1957, p. 172, and Aug. 1957, p. 158.

R. H. Schnoor, Pres. of Conapac, states that the Formvac line will be integrated into the Roto Bag and Holweg lines of equipment. Complete demonstration and service facilities on all Formvac machines will be maintained through Conapac's affiliates in New York City.

Expects 25% increase in sales

Total industry sales of reinforced plastic panels increased 20% during 1957 and an additional 25% rise for 1958 is predicted by David S. Perry, president of Filon Plastics Corp., El Segundo, Calif., manufacturer of reinforced plastic panels. He predicted that 62.5 million sq. ft. of reinforced plastic paneling, with an estimated retail value of $43,750,000, will be sold to builders, industry, and do-it-yourselfers in 1958.

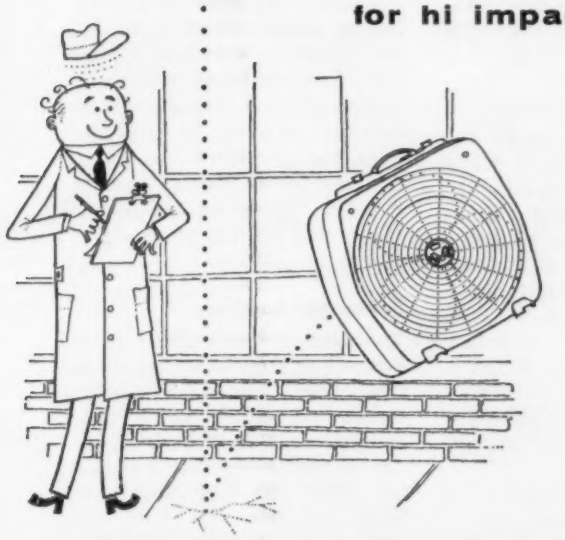
Mr. Perry further asserted that the estimated 50 million sq. ft. of corrugated and flat panels sold by the fast-growing, young industry during 1957 had an approximate retail value of $35 million. This represents a 20% increase in both footage and dollar volume over 1956.

In 1956, two thirds of the panels produced were for residential use, one third for industry; in 1957, Mr. Perry estimated, industrial

From the Dow family of plastics... look to

Styron 440M

for hi impact plus exceptional moldability

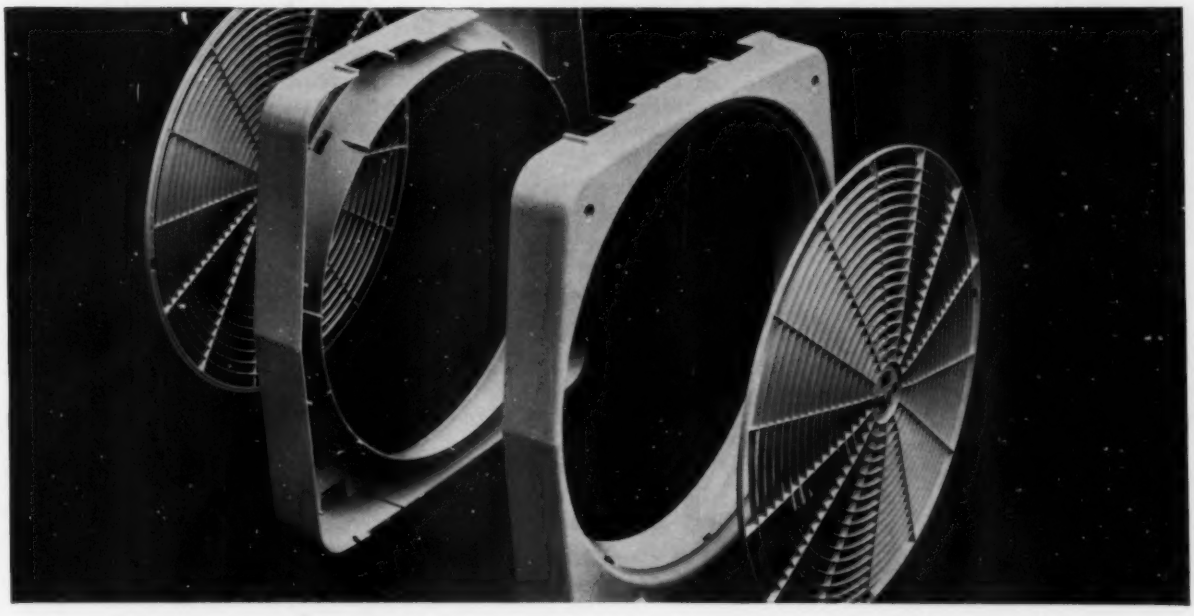


For durability and resistance to impact take this rugged fan housing molded of Styron* 440M. When dropped from window height, it displayed better impact resistance than an identical metal housing!

The housing was developed by a molder in cooperation with the fan manufacturer . . . a typical example of how creative selling and integrated design and production services pay off. The outstanding molding characteristics of Styron 440M were put to good use in this application. In fact, the front and back pieces were made from the same mold, assuring a sure, snug fit.

In this, as in all applications, Styron 440M provides a wide range of colors and a smooth, high-gloss finish for easy cleaning and smart appearance. You get advantages with every member of the Dow family of thermoplastics, too: quality materials, prompt shipments and expert technical service. See your Dow man soon. THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Department 1533A.

*Trademark of The Dow Chemical Company



From fan housings to freezer components—

Dow plastics lead the way

DOW

TYRIL* • STYRON* • ETHOCEL* • SARAN • POLYETHYLENE • PVC RESINS

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sales accounted for more than 40% of the volume. "We anticipate that 50% of the panels we manufacture in 1958 will be earmarked for industrial or commercial use," he reported.

In 1956, 10% of the reinforced plastic paneling manufactured was flat rather than corrugated; in 1957, he estimated, 15% was flat. Mr. Perry predicts this figure will reach 20% in 1958.

"In 1951," Mr. Perry said, "the prevailing cost of reinforced plastic paneling was $1.39/sq. ft. Improved production techniques and conversion to mass-manufacture, as a result of rising demand, have brought this cost down to an average of 65¢/sq. ft.

Metallized polyethylene

Polyethylene items can now be vacuum metallized with brilliant aluminum by the Flexomet Process developed by Metal-Kote, Inc., 35 Armory St., Worcester 3, Mass. The process, for which patents are pending, applies aluminum coatings to polyethylene articles without loss of flexibility and without danger of the metal flaking off, even under repeated flexing.

Good adhesion of the metallic coating to the treated polyethylene surface is based on the company's development of surface treatments and special lacquer formulations.

Epoxy-type plasticizer

The first in a new series of products for the vinyl field, Peroxidol 780, a light colored, polymeric, epoxy-type plasticizer with high resistance to exposure, temperature, and weather, has been introduced by Reichhold Chemicals, Inc., White Plains, N. Y. Made with epoxidized soybean oils and formulated for optimum balance of plasticizer properties, Peroxidol's almost complete lack of volatility allows higher blending temperatures.

Peroxidol 780 has a high flexibility retention and is particularly useful in helping to stabilize formulations containing phosphate plasticizer, where it enables higher processing speeds and temperatures.

Delivered in carload drums, the price of Peroxidol 780 is $0.3525/lb.

Implex TV control panel

High resistance to breakage and staining, easy moldability, and good paint adherence are the requirements for a gold colored shield which protects and conceals all but the edges of the control knobs of the latest model Philco TV sets. Implex, a modified acrylic resin for injection molding, developed by Rohm & Haas Co., was selected as the material meeting these specifications. It contains no plasticizers and has low water absorption.

The housing is molded in a single cavity die, then spray-painted on the first surface with gold lacquer, followed by a clear top coat. The molder is Bridgeport Moulded Products Co., Bridgeport, Conn.

Italian Plastics Institute

Instituto Italiano dei Plastici, Galleria Passarella 1, Milan, Italy, has been formed to spread knowledge of plastics and to bring about improvements in production. A warranty mark is granted to products which comply with specifications set up by Uniplast, Plastics Section of UNI-Ente Nazionale di Unificazione. Membership is composed of plastics manufacturers, converters, and dealers.

Dr. Paolo Mattiotto is president and Dr. Edmondo Casazza, manager.

Formica courses

A fabricator training school has been opened at the Cincinnati, Ohio, plant of Formica Corp., subsidiary of American Cyanamid Co., offering two one-week courses to Formica technicians and mechanics in allied fields interested in becoming Formica fabricators or wall applicators.

Vertical and horizontal surface applications will be discussed in the general course, as well as special application work such as construction of Vanitories, post-forming, and Formica applications to doors, window sills, and baseboards. A special course will be conducted for sink-top fabricators.

Classes will begin on the following dates: March 3, 10, 17; April 7, 14, 21; May 5, 12, 19; and June 9, 16, 23. There will be no charge for the courses, and the company will supply materials, tools, and equipment.

Harold Miller, a veteran of the Formica fabricating and model shops, will be in charge of the school.

Saran for awnings

Translucent awning fabrics which diffuse soft light while refracting ultra-violet heat rays are being woven from Saran 909, a basic material of The Dow Chemical Co., by the Lumite Div. of Chicopee Mills and Columbus Fiber Mills.

The material is said to be impervious to weather and not to rot, mildew, or fade. Saran 909 is air-permeable and does not absorb moisture. It will not sag; shrinkage is controlled to 3 percent.

The wholesale price per lineal yard, 31 in. wide, is $1.50 coated and $1.25 uncoated for a wide range of colors, including blue, green, maroon, green stripe, and maroon stripe. For solid white and solid yellow, the cost is $1.65 per lineal yd. coated, and $1.40 uncoated.

From rubber to plastics

Wooster Rubber Co., Wooster, Ohio, one of the leading manufacturers of housewares, has announced a corporate name change to Rubbermaid, Inc. The tradename Rubbermaid was originally coined to highlight the company's first product, a rubber dustpan manufactured in 1934.

The company has added a new plastics products group to its housewares line of molded rubber and covered-wire items. According to J. R. Caldwell, presi-

U.S.I.

Vol. III No. 2

POLYETHYLENE PROCESSING TIPS

PREDICTING END PROPERTIES OF BLENDED RESINS

A polyethylene processor may attempt blending of resins either for economic reasons or to attain a specific set of properties.

He may be successful, but blending, in general, is not considered good practice because it is difficult to obtain a homogeneous blend and the end results are difficult to predict — especially if the resins are from different manufacturers.

However, if you find it necessary to blend, it is possible to predict certain end properties with reasonable accuracy.

Melt index and density are predictable

Assuming that your polyethylenes are closely enough related, it is possible to blend for specific melt indexes and densities and therefore to obtain the desired properties that are functions of either of these.

The chart and the formula given here will enable you to predict either melt index or density. If you are blending for melt index, the logarithmic average will give the correct figure. Simply follow the directions in the caption under Figure 1. If you are blending for density, the arithmetic average will be correct. Simply use the formula described in the example given with Figure 2.

Recommended Precautions

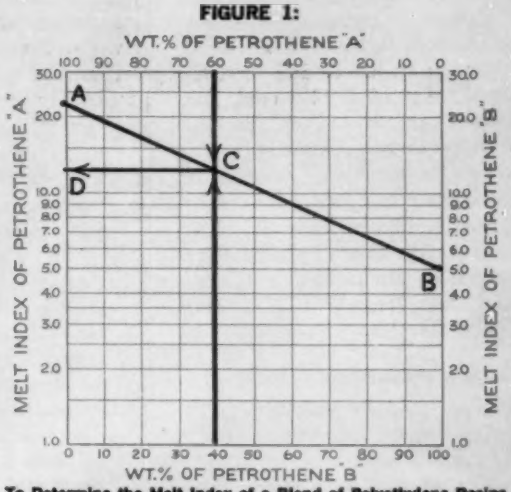
It is recommended that you limit yourself to injection molding when working with resin blends. If you are using a rotary drum for mixing, allow a tumble time of at least 20 minutes.

Shots should be relatively large, limited generally to about eight ounces in single cavity molds and twelve ounces in multiple cavity molds. Restrictive gatings, back pressure plates or similar devices, however, promote homogeneous mixing and sometimes smaller items can be effectively molded when these devices are used.

U.S.I. offers technical assistance

An answer to your individual need may well be found in obtaining directly from a manufacturer a polyethylene resin with the properties you want. And remember that U.S.I.'s Technical Service Engineers are always ready to work with you in finding the solutions to specific resin property problems.

FIGURE 1:



To Determine the Melt Index of a Blend of Polyethylene Resins having Different Melt Indexes —

1. Assume you are blending 90 pounds (60%) of U.S.I. PETROTHENE® 202 polyethylene resin with 60 pounds (40%) of PETROTHENE 201.
2. Petrothene 202 has a melt index of 22.0. On the left hand scale, therefore, fix a point at 22 (indicated by "A").
3. Petrothene 201 has a melt index of 5.0. On the right hand scale fix a point at 5 (indicated by "B").
4. Draw a line connecting 22 and 5.
5. Since you are using 40 percent of resin B(201), fix a point at 40 on the bottom and draw a vertical line.
6. From the point where these two lines intersect ("C"), draw a horizontal line so that it intersects the left hand scale ("D").
7. At "D" you now can read the melt index of your proposed blend.

This technique can be used to calculate the melt index of two polyethylene resins from the same manufacturer. If you do this type of blending frequently, you can set up these scales on any semilogarithmic graph paper. Your U.S.I. Technical Service Engineer will show you how.

FIGURE 2:

(% A) × Density of A + (% B) × Density of B = Density of blend

To Determine the Density of a Blend of Polyethylene Resins Having Different Densities —

1. Consider that you are mixing 105 pounds (70%) of U.S.I. PETROTHENE 206 (density 0.924) with 45 pounds (30%) of PETROTHENE 201 (density 0.916). Call resin 206 "A", and resin "201" "B".
2. Substituting these quantities and densities for the symbols in the formula above, you get the following numerical equation —

$0.70 \times 0.924 + 0.30 \times 0.916 = 0.9216$

3. The density of your blend therefore is 0.9216.

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dent, the sales success of the plastics group marketed under Rubbermaid clearly indicated that a change in company title now seems both logical and desirable.

Last year, U. S. and international sales of Rubbermaid, Inc. were over $21 million, derived from the company's line of housewares, automotive accessories, and commercial products lines.

Rubbermaid operates its main factory in Wooster; subsidiary companies are located in Cleveland, Ohio, Jamestown, N. Y., and Cooksville, Ont.

Custom dissolving

Rubber & Asbestos Corp., 225 Belleville Ave., Bloomfield, N. J., producer of industrial adhesives, announces that as a result of a plant expansion, it is now making available the firm's rubber and resin milling and dissolving facilities on a custom order basis. Current equipment includes a battery of 3000-gal. churns which permit the manufacture of one uniform batch of material in up to truckload quantities.

Equalizes prices

Taylor Fibre Co., Norristown, Pa., with a plant in La Verne, Calif., has eliminated geographic price differentials for its laminated plastics. The firm states that for 10 years the industry has charged 2¢/lb. premium for West Coast deliveries.

The company's price equalization applies to sheets, rods, and tubes, and to the material cost of parts fabricated from laminated plastics.

PVAc emulsions

Polyvinyl acetate homopolymer emulsions for the woodworking, textile and non-woven fabrics, paper, packaging, and general adhesives industries are now available from the Charlotte, N. C., and San Francisco, Calif., plants of Reichhold Chemicals, Inc. The company disclosed that it is manufacturing the resins by a process which enables it to modify certain emulsion characteristics to meet the requirements of specific users. The process also allows production of the emulsion in tank car quantities for greater uniformity and better quality control, according to RCI.

Molded nylon sample kit

A comprehensive assortment of molded nylon parts is offered gratis to engineers, designers, purchasing agents, etc. by Nylomatic Corp., 107 W. Trenton Ave., Morrisville, Pa.

These parts are manufactured by the firm's patented low-cost, high-production tooling process. They provide the designer with a typical cross-section of nylon applications and the samples serve as models of good design for mass production by injection molding.

Laminating patent

Issuance of U. S. Patent No. 2,817,618, covering the lamination of plastic sheeting to metals, to R. H. Hahn, chief engineer of O'Sullivan Rubber Corp., has been announced. The broad coverage in the 25 claims encompasses a good portion of the current activities in the field.

O'Sullivan states that it plans to make available to competitors processing rights under this patent.

Epoxy silicone combination

A new organo functional silicone chemical, Syl-Kem 90, has been introduced by Dow Corning Corp., Midland, Mich. It is an epoxy silicone combination with an epoxy group on each end of the molecule. The epoxy groups undergo the typical reactions of glycidyl ethers, making it possible to attach Syl-Kem 90 to a wide variety of chemicals.

Suggested use for Syl-Kem 90 is as a resin intermediate because the new chemical and active hydrogen compounds react to form substituted hydroxy alkyl siloxanes. These may be reacted further with isocyanates, anhydrides, fatty acids, and other materials to produce a wide variety of resins containing stable, flexible siloxane linkages.

Other uses suggested by the company include resin modification for alkyds, polyesters, phenolics, polyamides, cellulosics, epoxies, and amino resins. The company states that the chemical may be expected to improve the toughness, heat resistance, flexibility, weather resistance, and electrical properties of these resins.

The new chemical is also said to be compatible with vinyl chloride polymers and copolymers and tends to improve their heat stability and resistance to ultraviolet radiation.

New affiliate

Isochem Corp., 221 Oak St., Providence 9, R. I., has formed a new affiliate, Isochem Resins Corp., to supply specialized formulations in the epoxy, polyester, and allied resins fields.

The affiliate will make formulated compounds available for adhesives; coatings; impregnants; molding, tooling, patching, and casting; potting; etc. Technical service will also be provided.

Herbert L. Spivack is technical director; Herman C. Selya, sales manager; and Bruce M. Selya, chief executive officer.

Boron trichloride

Production of boron trichloride, used in the manufacture of rocket fuels, has been announced by Bellevue Laboratories, Inc., 30 W. 15th St., New York, N. Y. The company hopes that its new and economical process may overcome the high cost of these fuels.

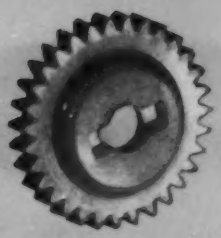
Boron trichloride is also being investigated as a catalyst in various plastic manufacturing processes.

Manufacturing and service company formed

Plas-Tech Equipment Corp., 751 Main St., Waltham, Mass., has been formed to manufacture high-speed testing machines for measuring tensile, flexural, and stress-relaxation properties at very high rates of loading.

The firm also offers a complete

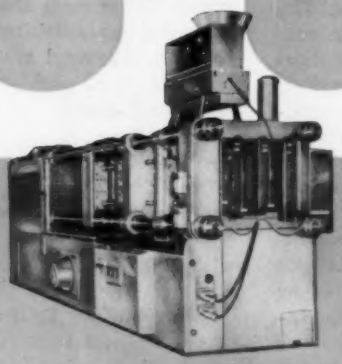
this is only part of our story...



This rugged, accurate gear is molded in long-wearing industrial Du Pont nylon. Like hundreds of our other nylon molded parts (bearings, cams, pinions, structural members and many other diverse shapes) the excellence of the finished product is the end result of many factors. The mold . . . the machine . . . and men who are skilled and experienced in their field . . . are the keys to success.

For the first time, all three keys to successful molding are offered in one comprehensive service — MOLDING SYSTEMS, INC.

MOLDING SYSTEMS INC.



AND THIS IS THE MACHINE — BATTENFELD high speed injection molding machine. Fully automatic operation . . . simple electro-mechanical design . . . with an amazing record of quality maintained over long production runs, Battenfeld offers lowest initial cost and lowest operating costs, too.

With mold design and construction . . . skilled, experienced technicians . . . and the world-famous BATTENFELD injection molding machine MOLDING SYSTEMS stands ready to serve you. Applications? Write Molding Systems Inc., Danielson, Connecticut.



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DANIELSON, CONNECTICUT

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consulting service to the plastics industry, with special emphasis on research, development, and materials testing and evaluation. For testing under controlled conditions, a special laboratory has been installed to conform with A.S.T.M. specifications on plastics.

Melvin Silberberg and Ross H. Supnik constitute the active management of the corporation.

Ink for polyethylene

A full color range, including metallics, for high-speed multicolor gravure printing on treated polyethylene film is available in the RP ink system developed by Claremont Pigment Dispersion Corp., Roslyn Heights, N. Y. It is said to offer all performance properties normally expected of conventional gravure inks.

These storage-stable concentrated inks provide the flexibility necessary for printing with engravings of any depth and pattern. Other advantages cited are: standard thinners can be used; all colors can be intermixed; no changes in printing procedures are necessary; multicolor printing is possible at high speed; and the operation is relatively static-free.

Heat-seal foams

Fabrication of plastic foam products by high-frequency heat-sealing will expand in 1958, according to Ivan H. Schwartz, Thermatron sales manager of Radio Receptor Co., New York, N. Y.

"Vinyl foams respond excellently to dielectric heating," Mr. Schwartz stated. "Polyurethane responds poorly but other foams, like polyether, show great promise of providing new customers for high-frequency fabricating operations." Some of the non-weldable foams have been used in conjunction with high-frequency sealing by being sandwiched between vinyl layers.

Mr. Schwartz asserted that molding, forming, and cementing of foam do not approach the production possibilities of fabrication from sheet or slab stock that includes covering, cutting, and embossing in one simultaneous operation.

He cautioned plastic foam fabricators, however, to incorporate counter pressures in their die designs to avoid tearing along seams when dielectric equipment is used. The Thermatron Div. is recommending that the die be wider, that any tear seal be backed up by a non-tear seal, and that a cooling cycle of a few seconds be provided to make sure the seal and surrounding areas do not weaken or burst when pressure is released.

Flame-retardant laminates

A line of Dilecto plastic laminates having high resistance to heat and flame has been introduced by Continental-Diamond Fibre Corp., a subsidiary of Budd Co., Newark, Del. Comprising nine different grades of varying characteristics for a wide range of industrial applications, the laminates combine good flame-retardant properties with the high strength and electrical qualities inherent in laminated plastics.

The laminates contain special chemical additives that dampen and extinguish flames started by electric arcs or other sources. Included in the line are the paper-base phenolic resin laminates, glass-mat polyester resin laminates, and glass-base epoxy resin laminates.

Coating resin for paper

A vinyl-acrylic copolymer coating emulsion, Resyn 2203, developed especially for the paper industry but also recommended for other coating applications, is being marketed by National Starch Products, Inc., New York, N. Y.

According to the company, the material possesses good film flexibility and strength, and is characterized by low viscosity, superior pigment binding ability, good film clarity, and good mechanical stability. The dried film is virtually odor-free.

The company asserts that the new resin can be utilized for all types of coated paper, from offset and letterpress stock to lightweight wraps and boxboards. In offset printing where base stocks are coated at the size press or machine coaters, Resyn 2203 can be used to obtain an increase in the coating strength and wet-rub resistance necesary for this printing process.

Liquid plasticizer

A technical grade of tributyl aconitate, a stable, liquid plasticizer for vinyls, cellulosics, and styrene copolymers, is available in research quantities from the Commercial Development Div. of Chas. Pfizer & Co., Inc., 630 Flushing Ave., Brooklyn 6, N. Y.

The company states that early test results showed tributyl aconitate to maintain low-temperature flexibility in styrene-butadiene copolymers and to impart improved heat-and-light stability to vinylidene chloride resins. Other tests showed it to be useful in plasticizing polyvinyl chloride, polyvinyl acetate, ethyl cellulose, and other cellulose esters and ethers.

Award for plastics applications

Outstanding applications of plastics will be honored this year with the inauguration of the Bachner Award sponsored by Chicago Molded Products Corp. as a testimonial to the five Bachner brothers who founded the company 39 years ago.

The award will consist of a plaque and $1000. The plaque will be presented to the winning company, the prize money to the person or persons whom it designates as most responsible for the achievement. Additional Honorable Mention citations will be made.

The award competition will be open to all manufacturers of products which employ plastics components or are totally plastic, and are molded, extruded, or formed. (Applications of fibers, flexible films, filaments, resins,



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and coatings are not eligible.) The award is to be presented every two and one-half years concurrent with the S.P.I. National Exposition and Conference.

The award committee consists of Arnold E. Pitcher, Chrmn.; Charles A. Breskin; Herbert S. Spencer; Edward Gudeman; and Arthur J. Schmitt.

Information and entry applications may be obtained from William T. Cruse, The Society of the Plastics Industry, Inc., 250 Park Ave., New York 17, N. Y.

British plastics progress

Total sales of British plastics in 1957 are expected to exceed 400,000 tons, 20% more than the previous year's record, according to the British Information Services. Biggest advances for 1957, as in the past five years, were in the thermoplastics group, primarily polyethylene, polyvinyl chloride, and polystyrene.

Production in 1957 is estimated at 55,000 tons for polyethylene—up 40%—with several new plants coming into operation in 1958; PVC, with a total production capacity stated to be around 90,000 tons, is expected to reach 65,000 tons as against 48,000 tons in the previous year; and polystyrene production about 30,000 tons, with almost all plants fully extended.

Bake-on plastisol coating

Broader protective qualities and higher heat stability are claimed for XL-12 Heat Fusible Plastisol, a bake-on coating for plating and processing equipment developed by The G. S. Plastics Co., 15585 Brookpark Rd., Cleveland, Ohio. It is said to exceed the usual standards for this type of coating in durability against abrasion, cuts, wear, and resistance to all normal plating solutions, short cycle vapor degreasing, and higher heats.

The plastisol develops a tough, flexible, glossy surface, allowing complete drainage for free rinsing, which eliminates drag-out and contamination of plating solutions. According to the company, XL-12 has a low viscosity and high fluidity, yet it affords good pick-up on the surface to be coated; these properties overcome air entrapment during dipping which prevents bubbles and pinholes. Higher heat stability has been achieved and the plastisol will not discolor even with prolonged baking. It is compatible with most other plastisol coatings.

The new plastisol system, using associated primers, is reported to make a powerful bond to ferrous and non-ferrous metals. Standard color is a high-visibility orange, but it can be supplied in any color desired.

Institute of Printed Circuits

Development of standards and other educational material to aid the user to purchase and use printed circuits more efficiently and more economically are the objectives of the new Institute of Printed Circuits, 27 E. Monroe, Chicago 3, Ill.

Activities of the IPC for 1958 will include a comprehensive survey of the size, facilities, and problems of the industry, as well as special programs of industry promotion and publicity, and a continuation of the work to develop both commercial and precision tolerances for printed circuits.

Officers are: president—W. J. McGinley, president of Methods Mfg. Co., Chicago, Ill.; vice president—A. R. Hughes, Electralab, Inc., Needham Heights, Mass.; treasurer—R. L. Swigett, vice president of Photocircuits Corp., Glen Cove, N. Y.

Source for prepregs

A licensing agreement has been consummated between U. S. Polymeric Chemicals, Inc., Stamford, Conn., and Santa Ana, Calif., and American Reinforced Plastics Co., Los Angeles, Calif., whereby U. S. Polymeric becomes the sole processor and sales outlet in eastern United States of prepregs prepared with resins in the high-heat field.

The agreement includes 91-LD, a phenolic high-heat resin, and 37-9X (a recent addition to the high-heat field), a phenyl-silane copolymerized resin. The resin prepregs involved are said to be important in missile applications where high-heat properties are in demand.

Both companies will handle these products west of the Mississippi, but the addition of U. S. Polymeric's manufacturing facilities on the East and West Coasts will supply better national coverage.

Harwick broadens silicone line

Silicone resins—SR-53, SR-98, and Dri-film 103, produced by General Electric Co.—are now available from Harwick Standard Chemical Co., Akron, Ohio, distributor for G-E. These silicone resins can be applied to any surface by brush, dip, or spray.

SR-53 imparts water repellency to many materials; SR-98 is suggested for high-temperature strength; that is, "hot-strength" hardness, and abrasion resistance; and Dri-film 103 imparts water repellency to surfaces.

Lenox buys Branchell

No better evidence of the present success and future potential of melamine dinnerware is needed than the recent purchase of Branchell Co., a leading manufacturer of same, by Lenox, Inc., one of the oldest and best known producers of high-grade chinaware in the United States.

The price paid by Lenox was in excess of $2 million. Combined annual sales volume of the two companies is expected to be $14 million.

Branchell was founded in St. Louis in 1946 by Ernest E. and Edward J. Branchell, who are now Chrmn. and Pres., respectively. Another plant was established in Puerto Rico shortly thereafter. Executive officers and present administrative, production, and sales personnel will continue to function in the same capacities. Branchell has four distinct melamine dinnerware lines and claims to be the first

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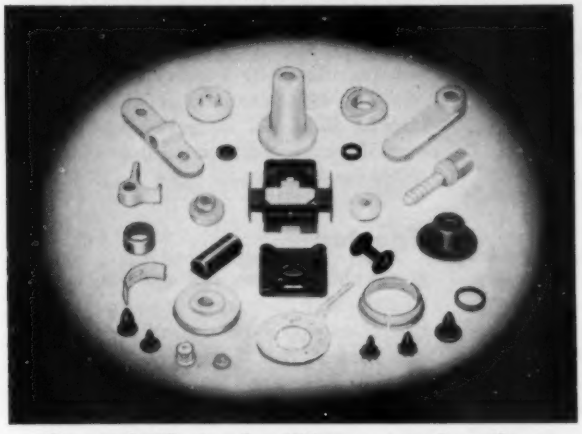
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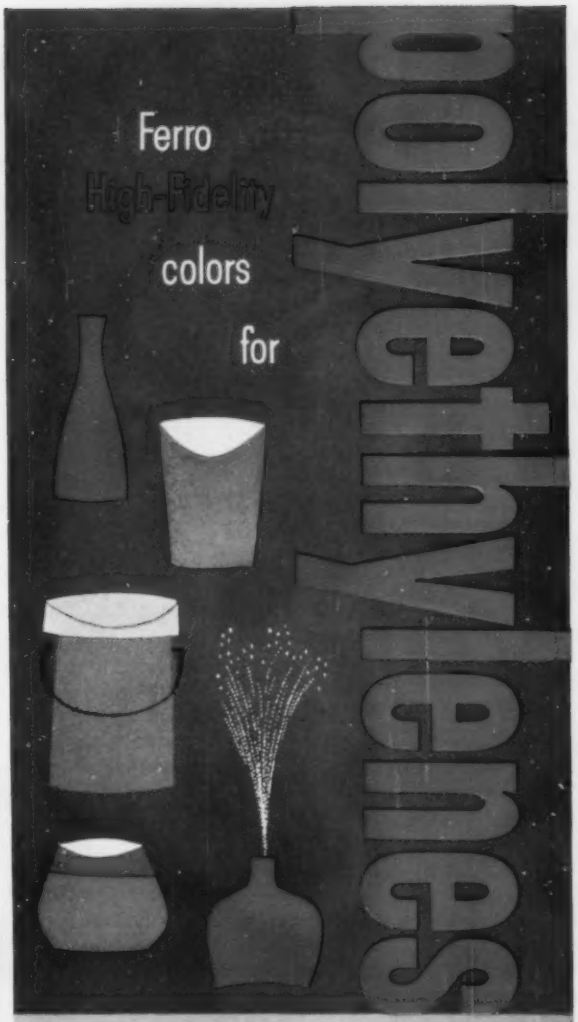
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company to introduce plastic patterns combining metallic gold with good translucency.

Lenox has headquarters in Trenton, N. J., and a new $3.5 million plant in Pomona, N. J. It was founded in 1889 in the belief that American ceramic art could be raised to or above the level of European potteries. Lenox chinaware has been in the White House since 1917. Leslie Brown is Pres. and John M. Tassie, Exec. VP.

Red pigment from Germany

Farbwerke Hoechst AG., West Germany, has introduced a new organic pigment claimed to have outstanding fastness properties for the coloring of plastics; the pigment is available through Carbic Color & Chemical Co., Inc., New York, N. Y., technical representative and distributor for the German firm in this country.

Designated PV-Fast Red B, the pigment is said to be applicable to all plastics. It is especially valuable for polyethylene because of its good stability at high temperatures. According to the company, this is the only organic red pigment which can compare in its fastness properties with the cadmium reds; it surpasses them in strength and brightness. The fastness to light is excellent, even in pale pinks (0.005% pigment). The pigment is insoluble in plasticizers and solvents. Other properties reported include very good fastness to alkali and acid, no blooming in PVC even at high temperatures, and no bleeding observed on PVC after 15 hr. at 212° F.

Polyvinyl acetate powder

Vinac RD, a powder form of polyvinyl acetate readily re-dispersible in water, has been announced by Colton Chemical Co., a Div. of Air Reduction Co., Inc., Cleveland, Ohio. Where a high percentage of water cannot be tolerated in a finished product or in an intermediate stage of formulation or blending of dry materials, the powder is said to permit a broader usage of polyvinyl acetate than is ordinarily possible. Another advantage claimed for Vinac RD is that it may be added to emulsions with moderate agitation to increase the solids content if desired.

According to the company, the product is exceptionally useful as an additive for dry concrete mixes to impart resiliency and cohesive action to new concrete for resurfacing. It also increases the adhesion properties of spackling compounds, improves textured paints, and, as an additive, fortifies cements and calcine paints.

The powder may also impart superior bonding action by upgrading dry-mix products such as those found in the ceramic and wettable-powder pesticide industries.

Bronze powders

Five shades of bronze powders for PVC formulations and three shades for polystyrene compounds are being offered by Hummel Chemical Co., Inc., 90 West St., New York 6, N. Y. The shades vary in tone from pale gold to deep gold.

Vacuum equipment manufacturer

Formation of General Vacuum Corp., 400 Border St., E. Boston, Mass., has been announced. The company will concentrate on engineering, development, testing, and sales of vacuum coating equipment. Arrangements have been made with Artisan Metal Products, Inc., Waltham, Mass., to fabricate equipment to General's designs.

Initially, the firm plans to concentrate on the intermediate sizes of special high vacuum equipment, as well as on developing an improved line of pilot-plant induction and arc melting vacuum furnaces.

W. G. Overacker, formerly sales manager of National Research Corp., is president. D. J. Tobin, previously in charge of engineering at NRC, is vice president and will head the design and engineering group. R. A. Knight, formerly plant manager at NRC, is treasurer.

Nylon clamps

Six new sizes of nylon clamps, with inside diameters of 0.562, 0.625, 0.687, 0.750, 0.875, and 1 in., are now available from Holub Industries, Inc., Sycamore, Ill. The clamps are precision injection molded from DuPont nylon FM-10001. They have a temperature range from −60° to 250° F. and will not support combustion.

According to the manufacturer, the clamps are strong and tough and hold their shape even under severe stress. They are impervious to fungicidal attack, easily withstand changes in atmospheric conditions, and resist corrosion or sweating. It is also reported that the clamps remain stable when exposed to mild acids, chemicals, oil, etc.; they are also claimed to be non-toxic and to have good abrasion resistance.

Polyethylene extrusions in large diameter

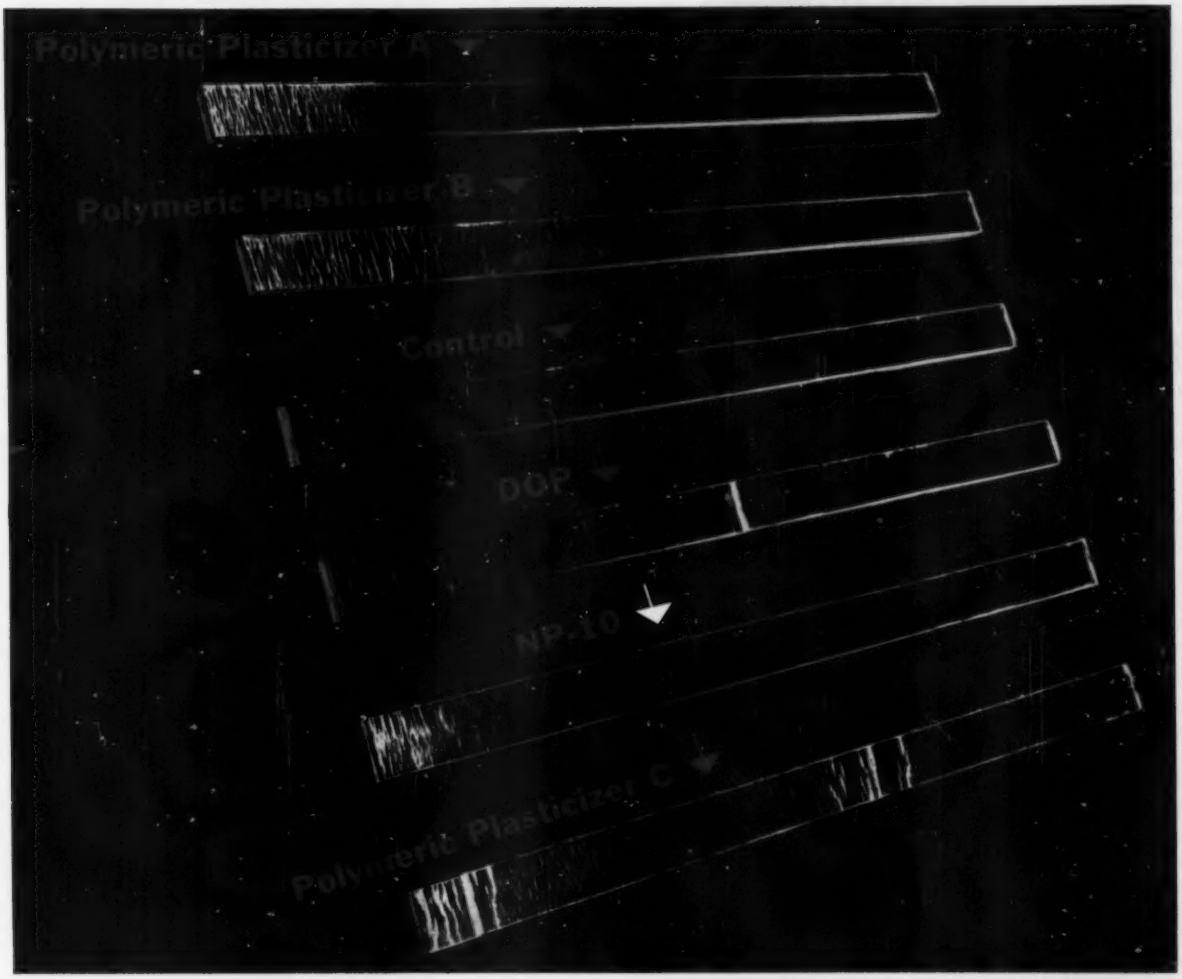
Linear polyethylene tubing ranging from ¼- to 6-in. O.D., extruded on a custom order basis, is being offered by Yardley Plastics Co., 142 Parsons Ave., Columbus 15, Ohio. Larger diameters are expected to be produced in the near future.

Epoxies

More about Honeywell epoxies. Additional information concerning Minneapolis-Honeywell epoxy resins has been recently published. Here is a brief resume:

Sealcast 501 is a general-purpose thermosetting compound that has room temperature handling and curing characteristics but may be accelerated by heating up to 150° F. It is suggested for embedment and encapsulation of electric and electronic components used at temperatures to 200° F.

Sealcast 502 is a high-temperature resistant epoxy potting compound that cures at 150 to 200° F. Usable temperature range is −100





Stress test of **vinyl plasticizers** shows

less polystyrene crazing with Eastman Polymeric Plasticizer NP-10

Crazing and staining of polystyrene surfaces in contact with compounded polyvinyl chloride can be virtually eliminated by using Eastman Polymeric Plasticizer NP-10.

In the test illustrated above carefully molded and cured polystyrene strips were subjected to external stress on an elliptical clamp. To magnify the effect on polystyrene resulting from its contact with plasticized vinyl compound, various plasticizers were poured directly on the strips and allowed to remain for 24 hours, or until fracture occurred.

The photograph shows the results and pointedly illustrates the relative inertness of Eastman Polymeric Plasticizer NP-10 on polystyrene surfaces.

Polymeric Plasticizer NP-10 exhibits permanence characteristics equal or superior to those of high-molecular-weight plasticizers, yet, being itself a compound of moderate molecular weight, blends in easily and rapidly. It is highly resistant to hydrolysis. Its loss from vinyl films to hydrocarbons, soapy water and activated charcoal is extremely low. It is odorless, tasteless, colorless, non-toxic and provides good low-temperature flexibility.

Eastman Polymeric Plasticizer NP-10 is an ideal primary plasticizer for vinyl applications such as refrigerator door gaskets, automotive trim... or wherever maximum permanence is essential.

Eastman CHEMICAL PRODUCTS, INC., KINGSPORT, TENNESSEE, subsidiary of Eastman Kodak Company

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; New York City; Framingham, Massachusetts; Cincinnati; Cleveland; Chicago; Houston; St. Louis. **West Coast: Wilson Meyer Co.,** San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.

to 350° F. It is suggested for encapsulation of unprotected electronic and other components.

Sealcast 503 is a hermetic-sealing potting compound. It has excellent resistance to thermal shock at temperatures below 250° F. and is suggested for encapsulating applications where hermetic seals around terminal wires and connector contacts are required.

Sealcast 504 is a casting and embedding compound for applications requiring machinability and high-temperature resistance and can be used in applications up to 350° F. It is suggested for embedment of electronic components for use at elevated temperatures and where machining operations are necessary.

Sealcast 505 is an unfilled, general-purpose epoxy and has room temperature handling and curing characteristics. It can be used as an adhesive for metal, glass, and thermosetting plastics, as well as embedments and coatings where fairly high thermal expansion can be tolerated. Sealcast 505 can also be used for fibrous glass in hand lay-up methods. Coatings can be colored with dyes or pigments.

Sealfoam 601 is a two-component epoxy foaming resin. When heated to 225° F., it expands and cures. It is suggested for foaming-in-place applications when small, tightly packed components are to be encapsulated. A fairly high exotherm is produced during foaming.

Sealfoam 603 is a ready-to-use single component foaming resin which first melts, then expands and cures. It is suggested for foaming-in-place applications.

All of these materials have a 1- to 2-yr. shelf life.

Epoxy lead compound. Leadcast, an epoxy-based, lead-filled thermosetting casting compound for use as a radioactive shield or as a high-density molding compound has been introduced by Telectro Industries Corp., 35-16 37th St., Long Island City 1, N. Y. The material has a density of 6.6 g./c.c., is harder than pure lead, and has a greater structural rigidity than pure lead. It has a hard surface with a glossy appearance that is impervious to weather and chemically resistant.

Leadcast may be molded with any structural members and is said to produce excellent bonding results. It can be cast, using an inexpensive mold, into a variety of shapes with an as-cast tolerance of ±0.0005 inch. The surface requires no finishing and is reported to be inert to oxidation or other corrosive contamination. The hardness can be controlled from that of a semi-rubber-like material to that equivalent of a cast aluminum.

Varnish for severe duty. Maraset BV-790, a clear epoxy varnish to protect metals and other materials from severe heat and corrosion hazards has been added to the Maraset line of Marblette Corp., 37-31 30th St., Long Island City 1, N. Y. The metal-baking resin is said to adhere firmly to cleaned and dried surfaces on which it is brushed or sprayed. After a heat cure of 20 min. or longer, it sets to form a thin but tough and flexible coat which resists abrasion and chipping, and maintains chemical resistance at temperatures as low as −60° and as high as 200° C. The resin is used as a single-component protective system, requiring no catalyst addition prior to cure.

BV-790 is being used as a barrier against corrosion and chemical deterioration for metal products, such as cans, drums, brass and other hardware, cosmetic containers, and appliances. Its clarity assures covering original finishes without discoloring or obscuring them. The resin is also used as an undercoat in fabrication of plastic tools and dies.

The dielectric strength of the material and its ability to function even at extreme temperatures and in highly corrosive atmospheres make it suitable as an insulating coat on electrical and electronic components.

Adhesive for concrete. Many difficult patching problems, such as the leveling of floors that are badly deteriorated and contain ruts, gullies, holes, etc., can now be solved with the use of Carboline Concrete Adhesive 192-34, a modified epoxy adhesive developed by Carboline Co., 331 Thornton Ave., St. Louis 19, Mo.

Entire floor areas can be resurfaced with 192-34. It is claimed that a tight bond of the new concrete to the old concrete is assured, making it possible to repair broken corners on concrete bases, islands, etc.

The adhesive has a solids content of 90% by weight, applies at a thickness of 6 mils. Coverage is 200 sq. ft./gallon.

Inexpensive core drier. Hysol HF 1385, a casting epoxy said to eliminate the need for expensive core driers for foundries, has been jointly developed by Lebanon Steel Foundries and Houghton Laboratories, Inc., Olean, N. Y. It is said to be especially suitable for use with dielectric ovens.

Fluorocarbons

Flexible copper-clad Teflon. Continental-Diamond Fibre Corp., a subsidiary of Budd Co., Newark, Del., will manufacture glass-supported Teflon tape with copper foil bonded to one or both sides for use as etched flexible cable harnesses for missiles and aircraft, or as flexible connectors in multiple-array printed circuit stacks for computers and control devices.

Electrolytic copper foil in weights of either 1 or 2 oz./sq. ft. is applied to one or both sides of cementable glass-supported Teflon grades GB-108T, GB-116T, or GB-128T. Depending on the weight of the copper foil and the grade of Teflon tape, the over-all thicknesses run from 0.006 to 0.016 inch.

At the present time, the company can furnish the material on a developmental basis in lengths up to 30 ft. and widths up to 6

inches. CDF expects to manufacture it on a production basis in lengths of 100 ft. or more in the near future.

If the material is supplied on copper foil on one side only, the other side can be furnished cementable or non-cementable; for certain applications, copper foil cemented to unsupported Teflon can be supplied.

Rods in small increments. Chemplast, Inc., 3 Central Ave., E. Newark, N. J., announces the development of new extrusion techniques for the production of Teflon rods in diameters from 1/32 to 2 in. in extremely small increments. The firm asserts that it is equipped to supply all sizes of rod stock within this range to the nearest 0.001 in. at no extra cost. Sizes over 2-in. diameter can be supplied in molded form.

The company also points out that all its products for the electronics industry are made from virgin Teflon and meet AMS and MIL-C-17B specifications.

Chemplast, which also supplies tape, tubes, and sheets of Teflon, as well as wire coated with Teflon, has recently expanded its production and warehousing facilities.

Low-temperature pulverizing. Liquid Nitrogen Processing Corp., 451 Booth St., Chester, Pa., is specializing in the development of Teflon molding compounds that contain fillers such as fibrous glass, graphite, calcium fluoride, asbestos, molybdenum disulfide, carbon black, metallic powders, and Fiberfrax. LNP has also developed a complete line of purified colors which are used in Teflon molding powders for tape and other electrical components; in many instances, these pigments have been found beneficial in the coloring of Teflon 6 for paste extrusion processes.

Another technique perfected by the company is for the cleaning, pulverizing, and processing of residues of Teflon and Kel-F left over from molding and fabricating operations.

In the field of Teflon molding compounds, LNP research is directed at improvement of dispersion techniques and in evaluation of new compositions. One development is a porous or spongy Teflon now available in various grades and shapes.

Pulverizing with liquid nitrogen is indicated where 1) the materials might thermally degrade during polymerization, 2) a reactive compound would be converted because of heat elevation, and 3) where the materials will soften or melt at a low temperature.

Reinforced plastics

Hetrolac 105, a transparent lacquer available in commercial quantities from Durez Plastics Div., Hooker Electrochemical Co., N. Tonawanda, N. Y., has proved effective for coating fibrous glass-reinforced polyester corrugated or flat panels to inhibit discoloration and other degradation caused by exposure to weather and sunlight, according to tests reported by the company.

The lacquer can be brushed or sprayed, will dry tack-free in 5 to 10 min., and can be stored indefinitely in closed containers in a cool place.

Durez supplies Hetrolac 105 currently in 55-gal. non-returnable drums at 75¢/lb. and in 5-gal. non-returnable pails at 85¢/lb.

Strengthens laminations. A low-cost reinforcing material for pressure-formed laminates, designated #5J-1, is being offered by Bean Fiber Glass Div., D. D. Bean & Sons Co., Jaffrey, N. H. It is claimed to combine woven fibrous glass roving and a jute mat which results in a high strength, high bulk lamination.

New council. The Fiberglass Reinforced Panel Council, comprising manufacturers of fibrous glass-reinforced plastics panels and suppliers of the raw materials, has been formally organized within the framework of The Society of the Plastics Industry, Inc. to undertake a program of industry research and user education for both flat and corrugated panels. The group has been convening informally since 1952.

The first evidence of the user benefits from the Council's program is the new Commercial Standard (CS-214-57) for Glass-Fiber Reinforced Polyester Corrugated Structural Plastics Panels which went into force on October 16, 1957. To make identification quick, easy, and assured, hallmarks or seals have been developed which may only be used on panels meeting the standard.

The council is restricted to companies actively engaged in the manufacture of reinforced plastics panels and to suppliers of materials used in these panels. Membership in the S.P.I. is another prerequisite to membership in the Council. However, meetings are open to all interested parties. An annual meeting will be held each April, other regular meetings in August and December, and special meetings upon approval of two thirds of the members.

John S. Berkson, president of Alsynite Corp. of America, is chairman and G. R. Huisman, of Filon Plastics Corp., is vice chairman.

Expansion

Frank W. Egan & Co., manufacturer of machinery for the plastics processing and paper converting industries, has completed a 16,000-sq. ft. addition to its plant in Somerville, N. J., to augment its manufacturing, office, and laboratory facilities.

The laboratory will be devoted to testing and research in both the plastics extrusions and paper converting fields. The plastics section, already in operation, is equipped with a 2½-in. extruder and auxiliary equipment.

The paper converting section will be equipped with various types of coating heads, an experimental dryer, unroll, and winder capable of handling webs up to 18 in. wide. Further experimental work in the company's recent development of high-velocity drying will be carried out. The evaluation of various coating heads is another project slated for immediate action.

Narmco Adhesives & Plastics Co., Costa Mesa, Calif., has purchased all outstanding shares of **Santa Barbara Plastics,** manufacturer of vinyl-coated materials for air-

The Plastiscope

craft, industrial, and agricultural end uses. The company will be operated as a wholly-owned subsidiary under the general management of **Narmco Resins & Coatings Co.**, another subsidiary of the parent firm. **M. Scott Moulton,** Pres. of Santa Barbara Plastics, is Mgr. of the new subsidiary. All company products will henceforth be marketed by the Commercial Sales Dept. of Narmco Resins & Coatings Co.

Santa Barbara Plastics will continue to occupy its plant at Santa Barbara, Calif., but early expansion of these facilities is contemplated.

The acquisition was described as a further step in a planned product diversification program aimed at strengthening Narmco's sales position in non-military markets. It will add an important second source of supply for a number of structural adhesives and laminating materials used by the parent company.

Heyden Newport Chemical Corp. announces the opening of an automated continuous-production plant at Fords, N. J., which is capable of producing 25 million lb. of pentaerythritol annually. New methods provide flexibility in producing any grade or type of this industrial chemical which is primarily used in weather-resistant, quick-drying paints, enamels, resins, and other surface coatings. Pentaerythritol is also finding increased use in alkyd resin production.

The Fords plant is part of a major expansion program involving approximately $25 million in the past five years. Another new facility at Fords for the manufacture of salicylaldehyde will be completed shortly. It is reported that this facility will produce over 1 million lb. of this chemical annually.

The Richardson Co. has broken ground for the construction of a chemical pilot plant adjacent to its general offices and laboratories in Melrose Park, Ill. The unit is planned to meet the need for facilities for advanced chemical process research and development for new products arising from the company's expanded research program. Prototype equipment is expected to have sufficient flexibility to be also useful in chemical engineering studies.

Witco Chemical Co. has announced plans for the construction of a phthalic anhydride plant with an annual capacity of 20 million lb., adjacent to its present manufacturing facilities in Chicago, Ill. The structure will be designed and constructed by Scientific Design Co. and is scheduled for completion in early 1959. This is a new product for Witco and will be sold through its Organic Chemicals Div., which also markets its plasticizers, stearates, and dryers.

The company has also announced the acquisition of the Stearate Dept. of **Sun Chemical Co.**, which will provide Witco with production facilities for metallic stearates in four locations in the United States and one in Canada.

Joseph L. Kearns, formerly sales manager of the department at Sun, has joined Witco in a similar capacity and will have direct supervision of the new operation. He will make his headquarters in the executive offices at 122 E. 42nd St., New York City. Existing personnel will continue to operate the plant at Wood River Junction, R. I.

Morningstar, Nicol, Inc., producer of chemical and starch products, and its principal industrial adhesives manufacturing subsidiary, **Paisley Products, Inc.,** have merged to form a single corporation, **Morningstar-Paisley, Inc.,** New York, N. Y.

Also absorbed into the new corporation are several subsidiaries, including **Haberland Mfg. Co.** and **Federal Adhesives Corp.,** both acquired last fall. **Hayes Adhesive Co., Inc.,** St. Louis, Mo., and **Aroostook Potato Products,** Houlton, Me., will continue as separate subsidiary corporations. Several West Coast subsidiaries of Morningstar and Paisley have all been absorbed into **Morningstar-Paisley, Inc. of California.**

American Cyanamid Co. announces that construction of a product development laboratory and pilot plant for its Plastics and Resins Div. is underway at Wallingford, Conn., adjoining the company's present plastics production facilities.

Operation of both facilities is expected by late 1958. Approximately 70 persons, including chemists, molding engineers, and chemical engineers, will be employed.

Celanese Corp. of America has started production of trimethylolpropane at a new unit of its Bishop, Texas, plant. Capacity of the new facility is over 10 million lb. a year. It was also announced that the chemical was reduced from 41¢ to 39¢/lb., delivered in truckload quantities.

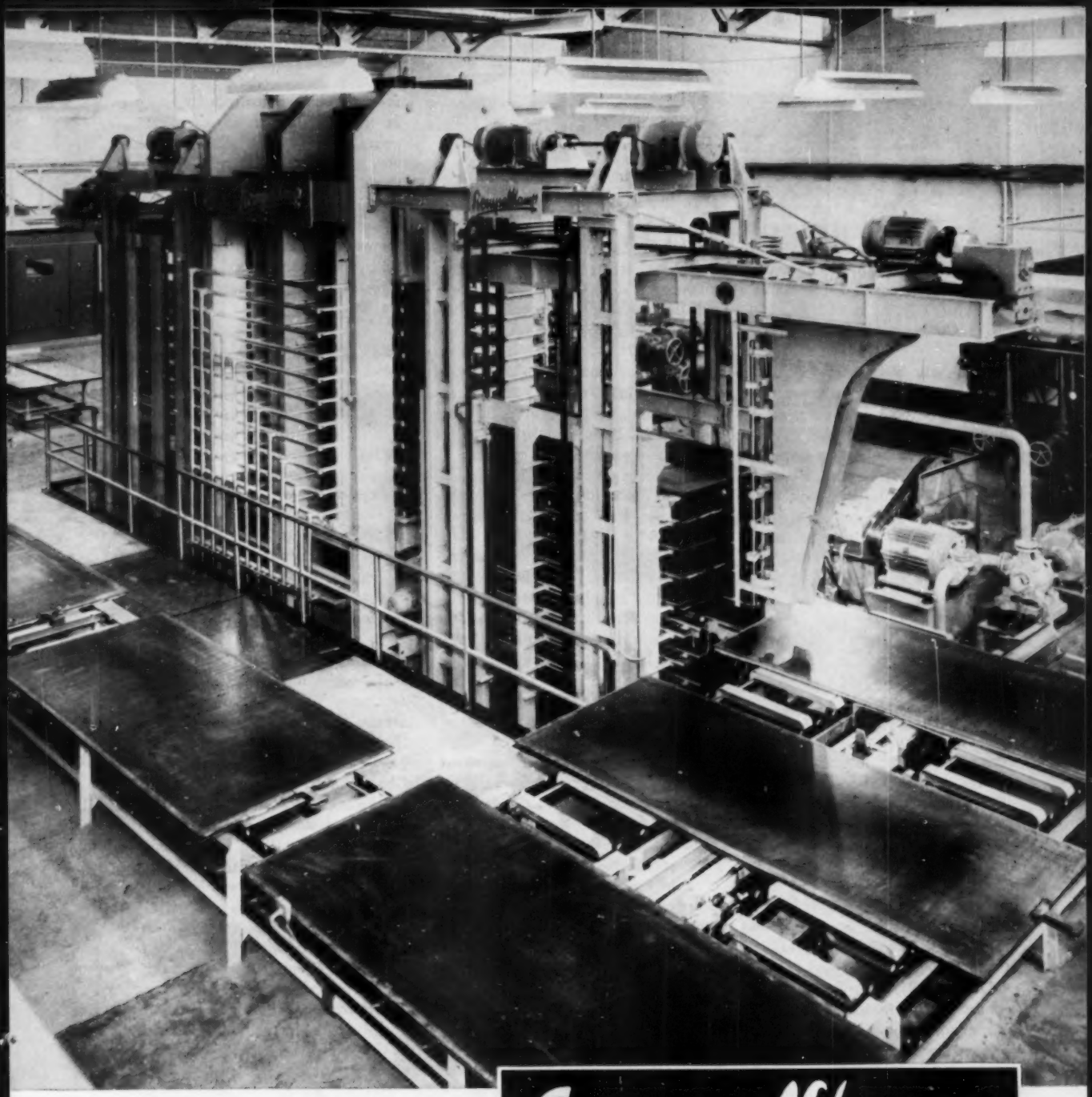
Trimethylolpropane is an intermediate used principally in the production of urethane foam; it also finds application in urethane coatings and alkyd resins.

Wyandotte Chemicals Corp. announces that the new multi-purpose oxide products plant at its North Works, Wyandotte, Mich., has gone on stream and is approaching rated capacity.

The new unit more than doubles the company's production of a wide range of ethylene oxide and propylene oxide derivatives used in the production of its Pluronic and Tetronic polyethers.

Sandoz, Inc. has acquired **Fine Colors Co.,** Paterson, N. J., manufacturer of pigment colors, thereby complementing its production of dyestuffs, textile chemicals, and pharmaceuticals.

Fine Colors will operate as a division of Sandoz. Production will continue under the direct supervision of **Dr. John W. Acker-**



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man, Pres. of Fine Colors for the past 16 years; **Max Gossweiler,** formerly Sales Mgr. of Sandoz' Dyestuff Div., is now Mgr. of the Fine Colors Div.

Kleen-Stik Products, Inc., Chicago, Ill., manufacturer of pressure-sensitive adhesive products for the graphic arts industry, has acquired the plant, equipment, and personnel of the **Press-On Div.** of **Rippolite Plastics Products, Inc.,** which will be operated as **Kleen-Stik Products, Inc. of California** at 8626 S. San Pedro, Los Angeles. The same basic Kleen-Stik products will be available from the new Los Angeles plant as from the plants in Chicago, Newark, and Toronto.

F. Lee Grimes will be in charge of sales for southern California, with headquarters in Los Angeles; **Leland E. Wiese** will head the northern California area, with offices at 325 Sacramento, San Francisco.

The H. O. Canfield Co., Bridgeport, Conn., announces expansions at its rubber plant in Clifton Forge, Va., and the plastic factory in Seymour, Ind.; both enlarged plants will be in full-scale operation in early 1958.

During 1957, Canfield started compounding fluorocarbon polymers for utilization by aircraft companies and others requiring parts that would withstand wide ranges of temperature and still maintain high physical properties.

The Extruded Plastics Div. developed refrigerator door gaskets which not only provides a proper seal but also complies with the new law pertaining to the latching of refrigerator doors. Another development of the plastics division at Seymour is an improved vacuum cleaner hose.

Sommers Plastic Products Co., 7 W. 18th St., New York 11, N. Y., announces the acquisition of **Milan Art Plastic, Inc.,** Red Hook, N. J. Milan embosses and finishes vinyl sheeting with an exclusive process developed in Europe, using special equipment, imported lacquers, and finishes.

Minnesota Rubber Co. has purchased **Park Tool Co.,** Minneapolis, Minn., manufacturer of tools and dies. Park's facilities will be used to expand the capacity of Minnesota's Tool and Die Div.

William Ecoff, owner and manager of Park Tool, has joined Minnesota as Mgr. of the division.

This is the second acquisition by Minnesota. Last March, the company purchased General Industrial Products, Inc., which is now operating as the Plastics and Latex Div.

Vista-Lux Corp. of America, Baltimore, Md., has opened a plant in Beltsville, Md., for the manufacture of its line of translucent fibrous glass-reinforced building panels under the tradename Vista-Lux. The new facility is headed by **Stuart B. Greenfield,** VP and Gen. Mgr.

The firm is planning an extensive promotional program, including consumer advertising, and will also cultivate the do-it-yourself market.

U. S. Polymeric Chemicals, Inc., Stamford, Conn., manufacturer of fabrics, papers, and mats, impregnated with thermosetting resins, including melamine, polyester, silicone, phenolic, and epoxy, is opening an impregnating plant in Utrecht, Holland. The facility, which is expected to go into full-scale production soon, will be under the supervision of **Maarten Oudegeest,** president of U. S. Polymeric.

A temporary office is located at Jaarbuersgebouw Vredenburg, Utrecht, Holland.

Bohn Aluminum & Brass Corp., Detroit, Mich., has acquired all of the outstanding stock of **Plastray Corp.,** maker of more than 80 different houseware products, such as ice cube trays, canister sets, refrigerator dishes, wastebaskets, etc., and custom molder for the refrigeration and automotive industries. The plant is at Walled Lake, Mich. The firm distributes its own products in the United States; in Canada, it distributes through its subsidiary, **Plastray Co. (Canada), Ltd.**

Management of Plastray will remain intact. **Douglas Jocelyn** is Pres.

Bohn operates 10 plants in Michigan, Indiana, and Illinois.

Pittsburgh Plate Glass Co. announces plans for the erection of a multi-million dollar fibrous glass yarn plant at Shelby, N. C., which will employ approximately 850 persons at capacity operation. The unit will have 16 glass furnaces capable of producing 25 million lb. of yarn annually.

The Dayton Rubber Co., Dayton, Ohio, has formed a Plastic Foam Div. as a result of the firm's increase of sales in the plastic foam field. Foam production facilities have been expanded at Marietta, Ohio, and Hawthorne, Calif., and the operation will be headed by **Harry Gerstin,** VP.

All Dayton plastic foam products, including polyesters and polyether urethanes, will be marketed under the tradename Stafoam. Basic urethane research and development will be carried on in the Freedlander research and development laboratories at Hawthorne. Custom service and prototype design will be handled in the laboratories at the Dayton plant.

Howard Noyes will direct sales in the eastern region and **Charles Clark** in the western territory.

Federal Tool Corp. has added a 30,000-sq. ft. warehouse to its present structure at 3600 W. Pratt Blvd., Chicago, Ill. It will contain 3-tier skids which will triple storage space and increase the over-all warehouse capacity by more than 50 percent.

Deceased

Daniel Alexander Robertson, Dir. of **Francis Shaw & Co., Ltd.,** Manchester, England, died on Decem-



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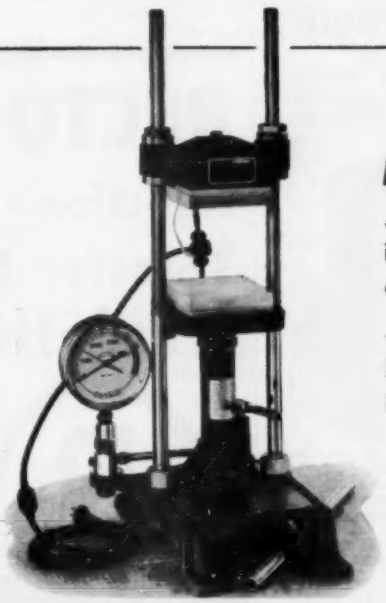
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ber 27, 1957. He had been affiliated with the company for 38 years.

J. Lionel Daniels, 51, managing director of the engineering firm of **T. H. & J. Daniels, Ltd.,** Stroud, Glos., England, died on January 9 from injuries received in an automobile collision. The family business, which he joined as a young man, was founded by his great grandfather 120 years ago.

Meetings

Plastics groups

March 26-28: The Society of the Plastics Industry, Inc., Pacific Coast Section, Fifteenth Annual Conference, El Mirador Hotel, Palm Springs, Calif.

April 28-29: The Society of the Plastics Industry Canada, Inc., Sixteenth Annual S.P.I. Canadian Section Conference, Royal Connaught Hotel, Hamilton, Ont. (Changed from March 6-7.)

June 26-27: The Society of the Plastics Industry, Inc., S.P.I. Midwest Section Conference, French Lick-Sheraton Hotel, French Lick, Ind.

Other meetings

March 11-12: Packaging Association of Canada, Canadian National Packaging Conference, King Edward Hotel, Toronto, Ont.

March 25-28: Packaging Machinery Manufacturers Institute, 1958 Packaging Machinery and Materials Exposition, Convention Hall, Atlantic City, N. J.

March 27-28: National Association of Store Fixture Manufacturers, Trade Exposition and Third Annual Convention, Conrad Hilton Hotel, Chicago, Ill.

April 14-15: American Institute of Electrical Engineers, Ninth Rubber and Plastics Conference, Sheraton Mayflower Hotel, Akron, Ohio.

April 15-17: Society of Chemical Industries, Plastics and Polymer Group, Symposium on "The Physical Properties of Polymers." Additional information may be obtained from Mr. K. H. C. Bessant, The Distillers Co., Ltd., Great Burgh, Epsom, Surrey, England.

May 1-8: American Society of Tool Engineers, Annual Meeting and Tool Show, Philadelphia Convention Center, Philadelphia, Pa.

May 20-21: The Chemical Market Research Association, Annual Business Meeting and Open Technical Session, Hotel Statler, New York, N. Y.

May 28-29: Deutsche Gesellschaft Für Chemisches Apparatewesen (DECHEMA), 2nd Congress of the European Federation of Chemical Engineering, Brussels, Belgium. (To be continued at Frankfurt am Main, Germany, May 31-June 8.)

May 31-June 8: DECHEMA, European Congress of Chemical Engineering and ACHEMA 1958 Congress, 12th Exhibition and Congress of Chemical Engineering, Frankfurt am Main, Germany.

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Companies . . . People

Eastman Chemical Products, Inc.: Spencer E. Palmer, promoted to 1st VP of **Eastman Chemical,** was formerly VP in charge of the Plastics Div.

Other changes in officer personnel for Eastman Chemical are: **R. S. Leonard,** formerly Comptroller, is now Asst. VP; **R. L. Flanary,** formerly Asst. Comptroller, becomes Comptroller. **Dr. James E. Magoffin** and **David C. Williams** named VPs. Dr. Magoffin will be in charge of the Chemicals Div.; **Mr. Williams** succeeds Mr. Palmer as head of the Plastics Div. **John P. Tokarz,** Asst. to the 1st VP of **Tennessee Eastman** since 1953, is now Asst. to Mr. Palmer. **E. C. Cathcart** appointed Sales Mgr. of the Plastics Div., succeeding Mr. Williams. **W. P. Bussart,** in charge of the St. Louis office, transferred to Kingsport as Asst. Sales Mgr. for plastics. **Guy A. Kirton,** Asst. Sales Mgr. of chemicals since 1953, will assume the duties of Sales Mgr., succeeding Dr. Magoffin.



S. E. Palmer



D. C. Williams

Field sales activities of the Chemical Div. of Eastman Chemical have been divided into three regional areas. **Robert H. Cannon** will direct sales of chemicals and dyes in New England and the Mid-Atlantic states. **John H. Sanders** becomes regional Sales Mgr. for those areas served from Cleveland, Cincinnati, and Greensboro, N. C. **Decatur B. Campbell, Jr.** appointed regional Sales Mgr. of the midwestern area for those areas served from Chicago, St. Louis, and Houston.

Allied Chemical & Dye Corp.—National Aniline Div.: Chester M. Brown, formerly Pres. of General Chemical Div., appointed Pres. of National to succeed the late **Albert E. Cleghorn.** Mr. Brown, recently named a VP of the parent company, will continue to hold that office.

General Chemical Div.: Irb H. Fooshee, formerly Exec. VP, succeeds Mr. Brown as Pres.

Barrett Div.: Harry R. Cote, appointed Special Rep. for Plaskon polyester resins, will coordinate development, technical service, advertising, and sales of polyester for urethane, premix, and other reinforced plastics applications. **Ralph W. Burdeshaw,** formerly in charge of Plaskon adhesive sales in the southeast, replaces Mr. Cote as Sales Rep. for industrial resins in Buffalo, Pittsburgh, and Cleveland.

Solvay Process Div.: Wilbur H. Brumfield and **Cortez P. Hackett** named VPs. Mr. Brumfield, formerly Asst. to the Pres., will assume increased administrative and executive duties in the New York office; Mr. Hackett, previously Dir. of Development, will be responsible for all operating and development department functions at Syracuse, N. Y. **Clyde A. Kitto** appointed Dir. of Operations; **Arnold Hanchett,** Dir. of Development; and **M. James Campbell,** Mgr. of Solvay's Syracuse plant.

Union Carbide Corp.—Bakelite Co.: Dr. Frederick H. Roberts appointed VP—research to succeed **Dr. James F. Eversole** who was named a VP of Union Carbide Development Co. **Roger A. Calsibet,** formerly Mgr. of Surface Coating Materials, appointed Asst. Mgr. of the New Product Engineering Dept., specializing in bonding, laminating, surface coatings, and flexible packaging. **A. B. Dickinson, Jr.,** formerly Supt. of the Ottawa, Ill., plant, named Mgr. of Personnel Administration to replace **H. D. Shannon,** retired. **Edgar A. Haine** now Supt. of the Ottawa, Ill., plant.

Du Pont, Polychemicals Dept.: Russell C. Wiegel, previously Dir. of Plastics Sales, promoted to Asst. Gen. Mgr. He is succeeded by **Clarence D. Bell,** formerly Asst. Dir. of Sales. **Jerry D. Shaw** appointed Asst. Dir. of Sales for polyethylene, nylon resin, and other plastics. **Roy L. Schuyler,** succeeds Mr. Shaw as Asst. Dir. for polyvinyl butyral resin, Teflon, and "Tynex" nylon monofilament. **William A. Franta,** previously Marketing Mgr. for Teflon, replaces Mr. Schuyler as Asst. Prod. Mgr.

Borden's: The chemical business of The Borden Co., which was known as The Borden Co. Chemical Div., has been renamed **The Borden Chemical Co., Div. of The Borden Co.** The company's chemical operations include 17 domestic plants and 11 outside the United States. Borden's manufactures formaldehyde, PVC and other resins and plastics, adhesives, and specialized products for the paper, textile, and paint industries. The firm also produces consumer products, including plastics garden and sprinkler hose.

James A. Wold named Gen. Mgr. of the Resinite Dept., succeeding **Grant C. Ehrlich** who will concentrate on research and new product

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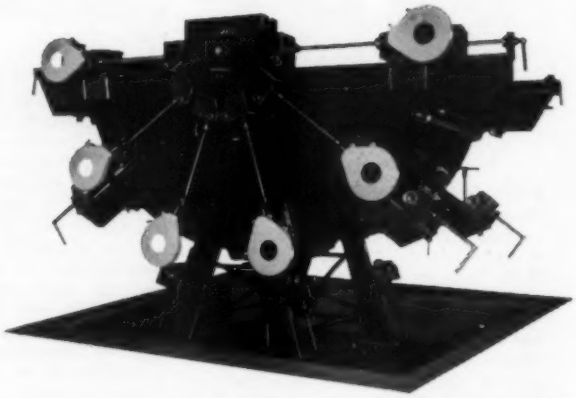
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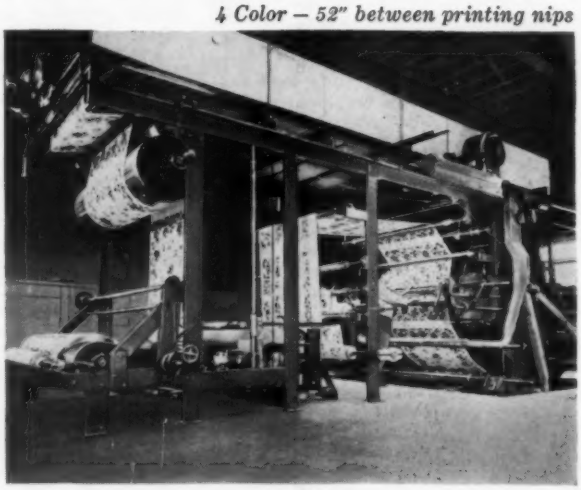
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development concerning PVC resins. Mr. Wold will be in charge of the extrusion facilities at Santa Barbara, Calif., and N. Andover, Mass., and will also continue as Gen. Mgr. of the Consumer Products Dept. **Howard Hoyt** transferred from the research laboratory in Philadelphia, Pa., to the recently completed foundry laboratory at Bainbridge, N. Y. He will be in charge of the resins and sands evaluation program and will supervise the further development of a new sand coating technique using liquid resins. **Robert S. Buffum** and **Donald K. Slade** have joined the Chemical Div.'s Polyco-Monomer Dept. at Leominster, Mass., as a project engineer and process engineer, respectively.

W. R. Grace & Co.—The Cryovac Co.: Following officers elected: **E. N. Funkhouser, Jr.,** Exec. VP; **David H. Taylor,** VP—marketing; and **Manning C. Morrill,** VP—operations.

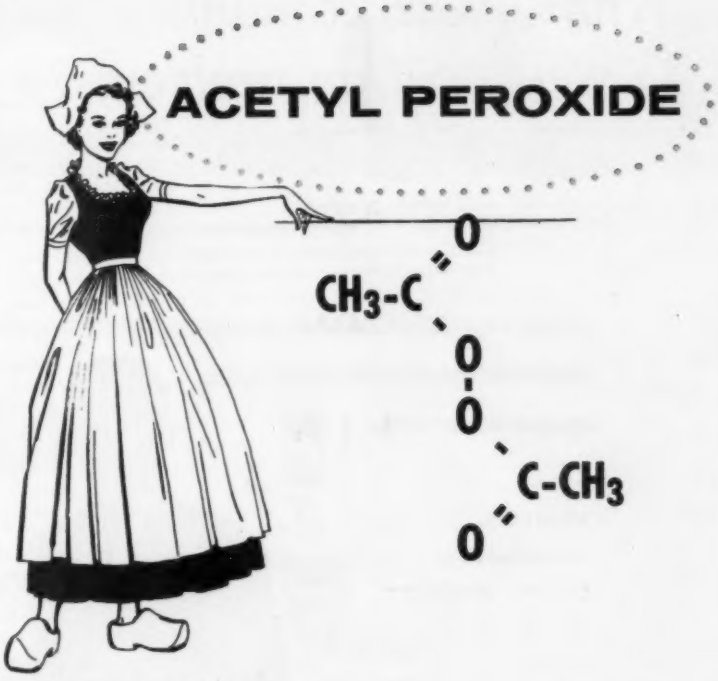
Dewey & Almy Chemical Co.: Karl L. Rohde, Jr., appointed Sales Rep. for organic chemicals, will initially assist in expediting special programs for the sale of the company's vinyl acetate polymers and copolymers, butadiene styrene latices and resins, plasticizers, and dispersing agents.

Diamond Alkali Co., Plastics Div.: Roger G. Richards, Mgr. of Research and Development since 1955, promoted to Sales Mgr. of the division. He succeeds **Kemble S. Lewis,** who is organizing a new sales market research section in the Commercial Development Dept. **George J. Koch,** formerly group leader, appointed to the newly created position of Mgr. of Technical Service. **Basil P. Gray,** previously with National Distillers & Chemical Corp., named Mgr. of Sales Development, also a new post.

The company has established a new Customer Technical Service Dept. with increased facilities, which is part of a divisional program for broadening Diamond's plastics industry sales and technical service activities.

Hercules Powder Co.: Harold R. Monfort, formerly Mgr. of the pentaerythritol and plasticizer plant at Mansfield, Mass., now Asst. Mgr. of the **Missouri Chemical Works,** Louisiana, Mo. **Dr. Einar West,** Asst. Plant Mgr. at Mansfield, succeeds Mr. Monfort as Mgr. **J. B. Talley** is Works Mgr. at the Louisiana facility, assisted by **Gordon Hoffman.**

The Synthetics Dept. has opened a sales district office in the Fisher Bldg., Detroit, Mich., with **E. S. Massey** as Branch Office Mgr. The



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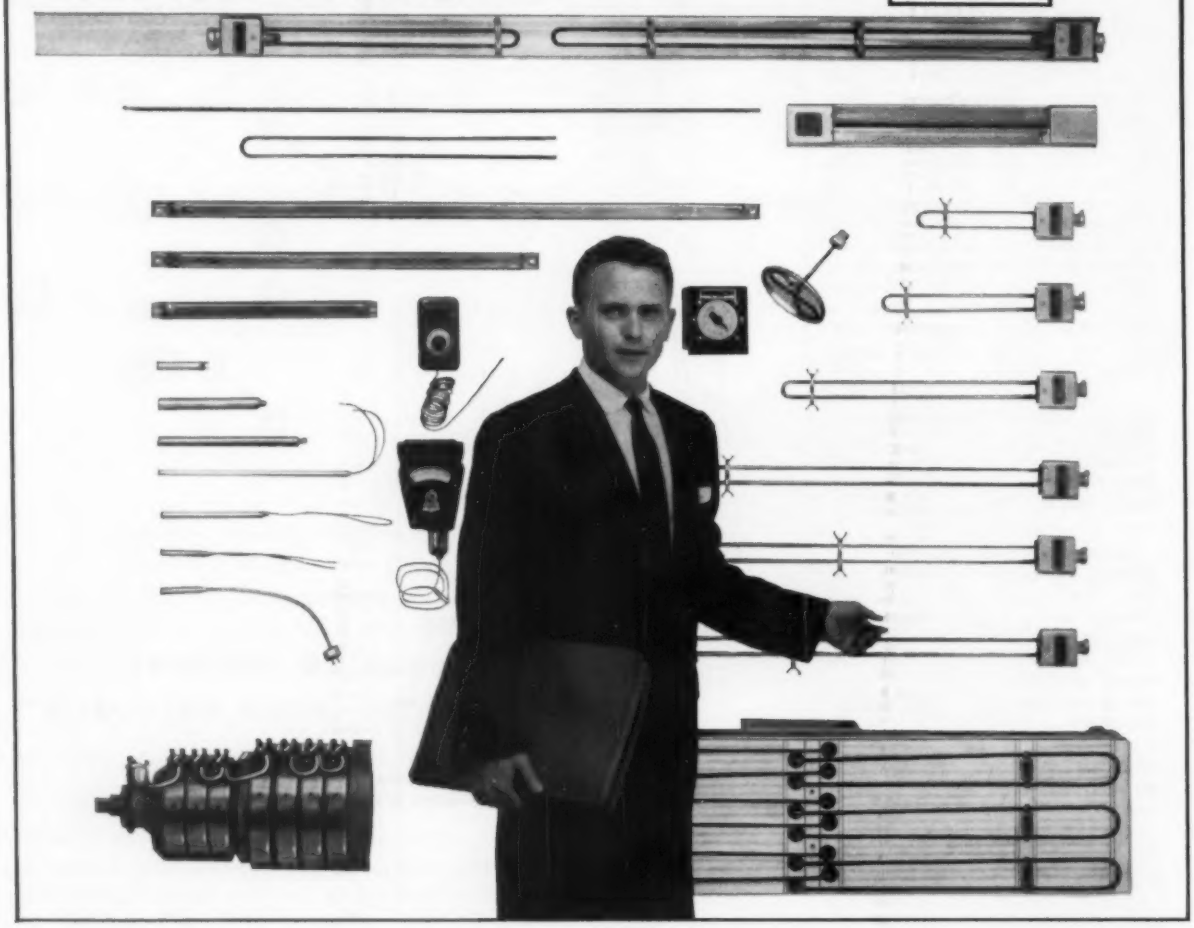
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Companies ... People

territory served will include the southern peninsula of Michigan and Lucas County, Ohio. This office will also service the needs of the Toronto office of **Harrisons & Crosfield (Canada), Ltd.**, chemical distributors.

American Cyanamid Co.—Plastics & Resins Div.: L. J. Francisco, formerly VP of Sales and Advertising of Formica Corp., named Asst. Gen. Mgr. of the division.

Industrial Chemicals Div.: J. Ray Coulter, appointed Mgr. of Manufacturing and Supv. of manufacturing activities of the division's 15 plants, which produce chemicals and chemical intermediates for the plastics, paper, petroleum, and metal processing industries. **Ben F. Melucci,** previously Technical Dir. of the Manufacturers Chemicals Dept., now Commercial Development Mgr.

Formica Corp.: J. A. Healy, formerly Eastern Regional Mgr., named VP. **Walter A. Smith,** Mgr. of Administrative Services, promoted to Asst. to the Pres.

Koppers Co., Inc., Chemical Div.: George H. Sollenberger appointed Prod. Mgr. for Super Dylan, (polyethylene) and **Henry C. Lavely** Prod. Mgr. for Dylite (expandable polystyrene). Both appointees, formerly associated with the Development Dept., have been transferred from the Kobuta Development Laboratory at Monaca, Pa., to headquarters in Pittsburgh, Pa.

Air Reduction Co., Inc.—Air Reduction Chemical Co.: James W. Frevert, formerly Plant Supt. of the vinyl acetate monomer plant at Calvert City, Ky., now Prod. Mgr. He will be in charge of all process operations, including the production of vinyl acetate, acetylenic alcohols, and vinyl stearates, and will continue additional responsibilities in connection with the general supervision of plant additions, new construction at Calvert City, and plant engineering functions. **James H. Burgess** named Plant Supt. to succeed Mr. Frevert; **Kenneth T. Cardner** succeeds Mr. Burgess as control chemist. **John J. Pullekines** appointed Plant Supt. of the new acetylenic alcohols and vinyl stearate plants at Calvert City.

Monsanto Chemical Co.—Plastics Div., Texas City, Texas: Dr. William H. Lane, Asst. Research Dir. since 1951, assigned additional duties, including polyethylene research and new administrative functions. **Seaton L. Hunter** promoted from Mfg. Supt. to Asst. Research Dir. of the Research Dept. **William F. Zimmermann,** previously Gen. Operating



☐ **PLASTIC SHEET FORMING** *by Robert L. Butzko.* The phenomenal number of applications and all pertinent information related to these materials are thoroughly surveyed. The book explains sheet forming use in over 14 different kinds of products. It also includes material selection, equipment, molds, sheet decoration, and costs. It provides an introduction to sheet forming for the engineer and designer, plus an explanation of the various methods of forming that the manufacturing technician needs to know. 1958, $4.50

☐ **POLYAMIDE RESINS** *by Don E. Floyd.* Contains the basic chemistry and raw materials of polyamide resins, methods for their manufacturer, a definitive discussion of key properties, and information on all important applications. These latter include fibers and filaments, coatings and films, moldings, extrusions, adhesives, inks, castings, and sealants. 1958, $4.50

☐ **POLYURETHANES** *by Bernard A. Dombrow.* Contains the chemistry and applications of these materials. The latter includes rigid foams, semi-rigid foams, flexible foams, rubbers, adhesives, coatings, textiles, and miscellaneous applications. Includes an important chapter on the handling of diisocyanates. 1957, $4.50

☐ **POLYETHYLENE** *by Theodore O. J. Kresser.* Covers this exciting new material in respect to its uses and why it is frequently preferable to other materials. Emphasizes a practical and selective method which features representative applications with a liberal use of illustrations. Includes recent advances in the field, and their fututre importance to industry. 1957, $4.95

☐ **CONCISE GUIDE TO PLASTICS** *by Herbert R. Simonds.* Every practical question you have about the uses, properties, cost, or sources of all plastics is specifically answered in this truly indispensable book. A striking feature lists the 43 most important plastics producers and all pertinent information including their addresses, products, trade names, etc. 1957, $6.95

☐ **CHEMISTRY OF NATURAL AND SYNTHETIC RUBBERS** *by Harry L. Fisher.* All commercial rubbers and their properties are surveyed in this book by one of the world's leading authorities on the chemistry of rubber. Covers chemistry of elastomers, vulcanization, acceleration antioxidation and antiozonation, natural rubber, latex, properties of natural and synthetic rubbers, some raw materials for, and synthetic rubbers, hard rubber, bonding rubber to metals, reclaimed rubber, and chemical derivatives. 1957, $6.50

☐ **PLASTICS ENGINEERING HANDBOOK of The Society of the Plastics Industry, Inc.** Contains exhaustive, well-arranged engineering information on the design, materials, processes, equipment, finishing, assembly, testing and standards of plastics and plastic products. Entirely rewritten, this new edition of the famous SPI Handbook is almost twice its former size. Suppliers of raw materials will find a complete set of accepted standards and specifications. Designers and engineers will find new testing methods fully described. Users of plastics will welcome the standards for testing, rating, certifying and labeling plastic commodities. 1954, $15.00

☐ **ENCYCLOPEDIA OF CHEMISTRY** *edited by Clark and Hawley.* The first complete, multi-author one-volume reference covering a broad spectrum of chemically important subjects. Over 800 articles, 500 contributors, and 1,000 pages of remarkably condensed, authoritative information on modern chemistry from Abrasives through Zirconium. No other single volume offers so much to all workers in chemistry and in the dozen or more sciences that border on it. 1957, $19.50

☐ **SOURCE BOOK OF INDUSTRIAL SOLVENTS** *by Ibert Mellan.* To be published in four volumes, this series arranges all the known solvents according to distillation point. For each solvent, a wide spectrum of properties is given in time-saving, tabular form.
Vol. 1: Pure Hydrocarbons, 1957, $6.50
Vol. 2: Halogenated Hydrocarbons, 1957, $7.00

☐ **QUALITY CONTROL FOR PLASTICS ENGINEERS** *edited by Lawrence M. Debing.* Introduces the subject of statistical quality control to plastics engineers and manufacturers. The book refers specifically to applications currently used in industry, and shows how to use basic statistical procedures in achieving highest possible standards of performance. 1957, $4.95

☐ **FIBERGLAS REINFORCED PLASTICS** *by Ralph H. Sonneborn.* The first complete treatment ever published on reinforced plastics. Covers in full detail the resins and glass reinforcements used, molding techniques, inspection and testing, properties and design considerations. Provides all those concerned with reinforced plastics with valuable information never before available in one compact volume. 1954, $4.50

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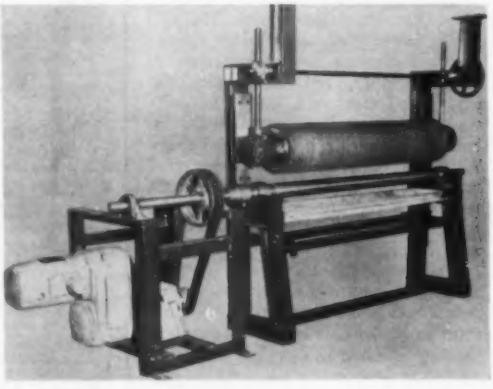
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Companies . . . People

Supv., now Mfg. Supt. **Drs. Walter B. Howard** and **Jack F. Draffen** promoted from department group leaders to scientists. **Herbert H. Nelson** made a group leader.

Vinyl Fabrics Institute: The following officers re-elected: Pres.—Fred L. Ford, VP of **Athol Mfg. Co.,** Athol, Mass.; 1st VP—**C. Gordon Jelliffe, Columbus Coated Fabrics Corp.,** Columbus, Ohio; and 2nd VP—**Paul Howard, Weymouth Art Leather Co.,** S. Braintree, Mass. **Paul F. Johnson** continues as Exec. Secy.

The Institute is composed of 17 companies manufacturing vinyl-coated fabrics and unsupported vinyl sheeting.

Ferro Chemical Corp. a subsidiary of **Ferro Corp.,** Bedford, Ohio, has recently completed a new sales and administration building.

Harry Davies Molding Co.: Robert C. Appleby, elected VP and Dir. of Sales. **Richard D. Riordan,** Adm. Asst. to the president, elected Secy.

Sun Chemical Corp.—Ansbacher-Siegle Corp.: Frank May, previously Plant Mgr., appointed Gen. Mgr. of the recently acquired division. He succeeds **Eric Blackstead** who was elected a VP of the parent company and Gen. Mgr. of its chemicals group. The division manufactures organic pigments.

Hooker Electrochemical Co.: Charles W. Selover named Mgr. of Purchases for the Niagara Falls and N. Tonawanda, N. Y., plants.

Durez Plastics Div. District sales office established at Kenton, Ohio, location of its branch molding compounds plant. **George A. Shroyer** appointed Dist. Mgr. for the area, including Ohio, Michigan, and parts of Indiana, Pennsylvania, Kentucky, and Tennessee.

The Detroit office, managed by **Kenneth J. Fuoco,** becomes a branch office in the district.

Both offices handle phenolic, polyester, and diallyl phthalate molding compounds; industrial resins; and Hetron flame-retardant polyester resins.

Wheelabrator Corp.: James F. Connaughton, Exec. VP, elected Pres. to succeed **Otto A. Pfaff,** who has retired but will continue as Chrmn.

Structural Plastics, Inc., 4907 Ohio Garden Rd., Fort Worth, Texas, was recently organized for the manufacture of building materials from fibrous glass and plastics. The firm has begun production at its new plant at 705 Pemberton, Fort Worth, of 2- by 2- and 4- by 4-ft. hyper-

bolic paraboloid canopies and accessories for installation.

Fred Disney is Chrmn. of the Board and **William R. Orr**, Pres.

Columbian Carbon Co., Carbon Black and Pigment Div.: Alan W. Bryant, formerly eastern Dist. Sales Mgr., now Asst. Sales Mgr. for Mapico colors. He succeeds **John T. Kealy** who has been named sales consultant.

Heyden Newport Chemical Corp.—Nuodex Products Co.: Frank X. Dwyer, formerly regional Sales Mgr., promoted to Gen. Sales Mgr.

Wallace & Tiernan, Inc.—Lucidol Div.: Arrangements completed with **Becco Chemical Div., Food Machinery & Chemical Corp.**, to manufacture and distribute acetyl peroxide under exclusive license from Becco.

Lucidol has complete facilities available at its Geneseo, N. Y., plant for the manufacture of acetyl peroxide in the form of a 25% solution in dimethyl phthalate.

The Richardson Co.: Gordon Ruschman appointed Mgr. of Plant Operations for the company's six plants; **Edgar Crane** named Plant Mgr. at Melrose Park, Ill. **Donald A. Sayles** and **Roger C. Corwin** have joined the Commercial Development Dept., recently formed to identify and develop markets for new plastics products. **William Dunlop** now at the central research laboratories at Melrose Park.

Joseph Davis Plastics Co.: Stanley H. Shur named Sales Mgr. **Anthony Pizzuta** and **William Kresge** appointed Sales Reps. for the metropolitan New York area. The company manufactures cellulose acetate and butyrate sheeting.

International Molded Plastics, Inc., Structoglas Div.: Harold H. Goldstein appointed Sales Mgr. for Structoglas reinforced plastic panes, panels, awning and patio materials. **Jack Carter**, named Mgr. of Marketing Research, will serve the Brookpark (melamine dinnerware) and Structoglas Divs.

Arvin Industries, Inc., Columbus, Ind.: **Robert G. Nau**, previously Mgr. of vinyl-metal laminate sales in the Automotive Div., named Dir. of Sales of the Arvinyl Dept. **John J. Broderick** appointed Mgr. of Arvinyl contract sales.

Lansky Die Cutting Corp. has moved from 192½ Greene St., New York, N. Y., to 473 President St., Brooklyn, N. Y.

L-O-F Glass Fibers Co., Corrulux Div.: Kenneth G. Peck promoted to Engineering and Product Mgr. and **Mrs. Barbara Fritz** to Sales Promo-

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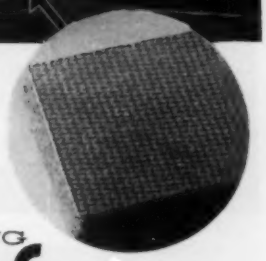
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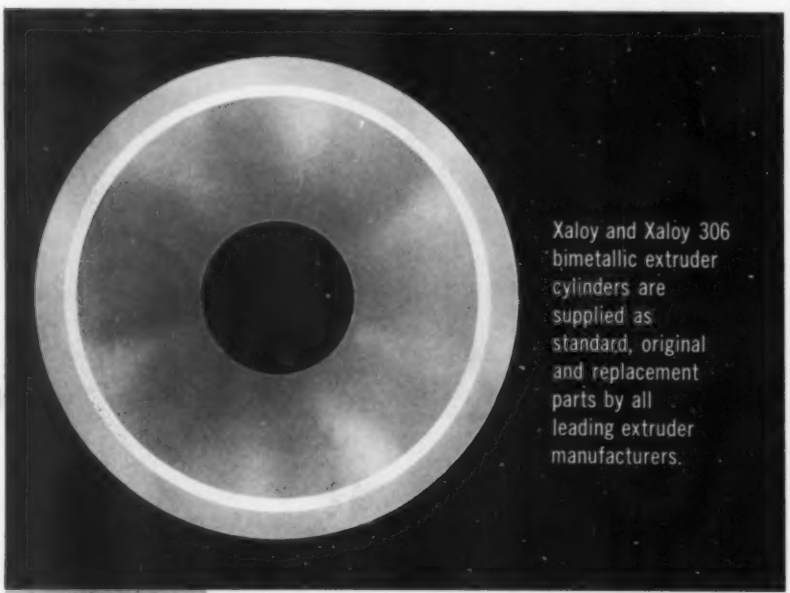
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Companies . . . People

tion Mgr. **Henry M. Bowers,** formerly Quality Control Mgr. at the Toledo, Ohio, plant, now Process Control Mgr. at Houston, Texas.

Witco Chemical Co.: Richard H. Dorsett and **Donald L. Johnson** joined the sales staff. Mr. Dorsett will headquarter at the Dallas, Texas, office and Mr. Johnson at San Francisco, Calif.

Molded Industrial Plastics, Inc. has moved from 150-45 Twelfth Ave., Whitestone, N. Y., to an enlarged plant at 131-37 Sanford Ave., Flushing 55, N. Y.

Charles Crowl Co., El Monte, Calif.: The following Sales Reps. appointed to handle the firm's thermoplastic sheet materials: **Charles E. Watts, Maineline Sales Corp.,** Los Angeles, Calif.; **H. Thorpe Covington,** Evanston, Ill.; **Ray A. Cunningham,** Fort Worth, Texas; and **Donald W. Leuthold, Walter W. Rust,** and **Bruce E. McCann, Fiberglass & Chemical Services, Inc.,** Seattle, Wash.

Delkay Plastics Corp., custom injection molder, has moved from 238 N. Freeman Blvd., Inglewood, to 13441 S. Western Ave., Gardena, Calif.

Dr. Nat C. Robertson, formerly VP of Research of Escambia Chemical Corp., appointed Gen. Mgr. of Research and Development of **Spencer Chemical Co.,** Kansas City, Mo.

Bert S. Taylor, VP of **FMC Organic Chemicals Div., Food Machinery & Chemical Corp.,** appointed Dir. of Marketing and Purchasing.

Thomas O. Williams promoted from Asst. Sales Mgr. to Gen. Sales Mgr. of **American Viscose Corp.'s Film Div.,** succeeding **John W. Little,** retired.

C. J. Windsor, formerly Mgr. of the Detroit plant, named VP—manufacturing of **Reichhold Chemicals, Inc.,** White Plains, N. Y. He will headquarter at RCI executive offices, supervising coordination and standardization of manufacturing procedures.

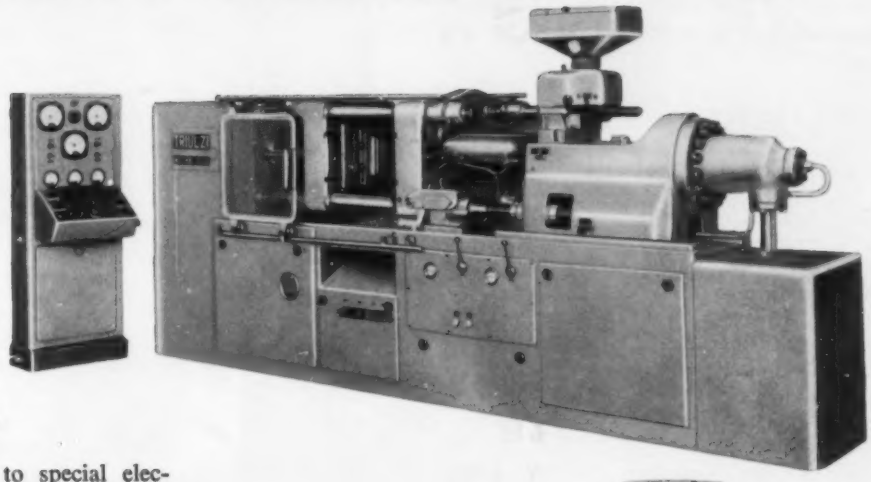
John K. Moffett, Jr. named Asst. Mgr. of Petrothene polyethylene sales for **U. S. Industrial Chemicals Co., Div. of National Distillers & Chemical Corp.,** New York, N. Y.

W. M. Cordner appointed Plant Mgr. of **Minnesota Mining & Mfg. Co.'s** Bedford Park, Ill., plant. He succeeds **Waldo G. Bretson,** recently named Gen. Mgr. of the **Mid-States**

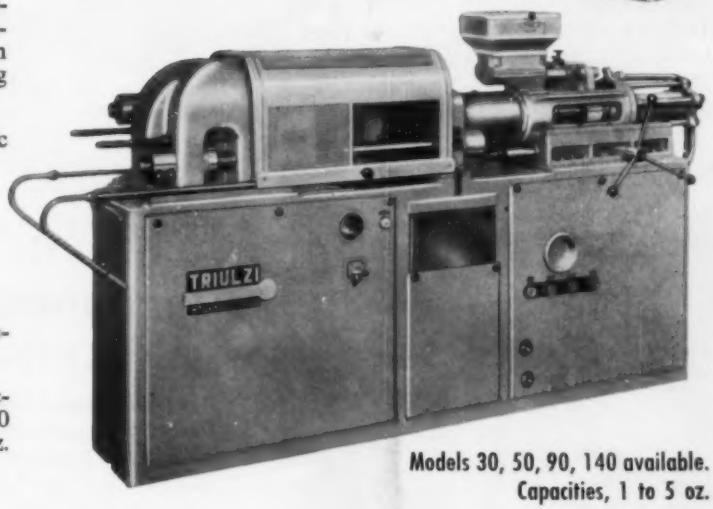
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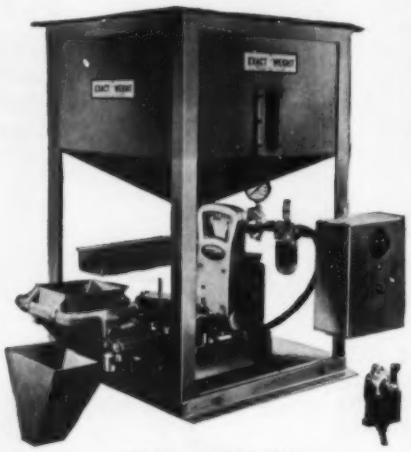
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Companies . . . People

Gummed Paper Div. at Bedford Park. In addition to Mid-States products, the plant produces commercial products for 3M's Reinforced Plastics Div.

William C. West, Jr. elected Pres. of **West Instrument Corp.**, Chicago, Ill., to succeed his brother, **Richard K. West**, who was lost in a recent airplane accident.

Frank P. Green, formerly Exec. VP, elected Pres. of **Plumb Chemical Corp.**, Philadelphia, Pa., manufacturer of fibrous glass-reinforced molding compounds.

Audley Clarke elected a VP of **Chemical Products Corp.**, E. Providence, R. I., compounders of vinyl plastisols and manufacturer of lacquers, solutions, and solvent-based film forming materials.

George M. Hale appointed to the newly created position of VP and Gen. Mgr. of **Canadian Resins & Chemicals, Ltd.**, Montreal, Que.

Harry A. Russell, formerly Tech. Dir., elected VP of **The Pantasote Co.** He will be in charge of research and development at the firm's plant in Passaic, N. J., and of its divisional plant, **The Eleonora Chemical Corp.**, producer of PVC resin.

Arnold A. Butterworth, formerly head of industrial chemical sales at the Camden, N. J., office, named an Asst. to **Donald L. Gibb**, Sales Mgr. of the Plastics Dept. of **The Dow Chemical Co.**, Midland, Mich.

Dr. W. Mayo Smith named Dir. of Research of **Escambia Chemical Corp.** The company's research and development activities are now conducted at Cambridge and Newton, Mass., and will be moved shortly to the new research center in Wilton, Conn.

Charles H. Brittenham named Dir. of Operations of **Revell, Inc.**, Venice, Calif., manufacturer of plastic toys.

Harvey G. Wismer, formerly Gen. Mgr., appointed VP of **Mannesmann-Easton Plastic Products Co.**, Easton, Pa., manufacturer of rigid plastic pipe.

Thomas J. Campbell named Sales Mgr. of **Metasap Chemical Co.**, a subsidiary of **Nopco Chemical Co.**, Harrison, N. J.

Walter R. Brandt named Branch Mgr. of the West Coast sales office of **General Dyestuff Co.** and Western Regional Mgr. of **Antara Chemicals**, sales divisions of **General Aniline &**

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Companies ... People

Film Corp., New York, N. Y. He will make his headquarters at the company's San Francisco, Calif., branch office and will be in charge of sales of dyestuffs, pigments, and chemicals.

Edward A. Coons, named Gen. Mgr. of **Acheson Dispersed Pigments Co.**, Philadelphia, Pa., will supervise ADP's operations, in Philadelphia; Orange, Texas; and Xenia, Ohio.

W. D. O'Morrow appointed Gen. Sales Mgr. of **Wasco Products, Inc.**, Cambridge, Mass. He will supervise the sales and promotional activities for such Wasco products as skydomes, pyrodomes, acrylic sheets, showerwalls, acrylite, and flashing.

Elliott N. Dorman named Sales Mgr. of epoxy structural applications resins for **Ciba Co., Inc.** He will direct sales from the **Plastics Div.** at Kimberton, Pa.

Alfred M. Johnsrud appointed Sales Engineer of **Frank W. Egan & Co.'s Plastics Extrusion Div.**, Somerville, N. J.

Robert Ross appointed Plant Mgr. of **Vista-Lux Corp. of America**, Beltsville, Md., manufacturer of structural panels of reinforced fibrous glass.

Herbert M. Rome, formerly Prod. Mgr., now Sales Mgr. of **Olympic Plastics Co., Inc.**, Los Angeles, Calif., custom molder.

Lester Scholl, previously Works Mgr., appointed VP in charge of production of **Tel-A-Sign, Inc.**, Chicago, Ill., producer of illuminated plastic signs.

Stanley Eysman appointed VP in charge of sales of **Cellofilm Industries, Inc.**, Woodridge, N. J., producer of nitrocellulose and vinyl acetate base solutions for the manufacture of adhesives, coatings, lacquers, etc.

E. Kenneth Burger has retired as Mgr. of the **Market Analysis Div.** of the **Chemical Products Dept., Esso Standard Oil Co.**, but will be retained as a consultant.

Albert D. Neipris appointed Pur. Agt. for the **Thermoplastics Div.** of **The Blane Corp.**, Canton, Mass.

Robert E. Dickson named Michigan sales representative for **Erie Resistor Corp.'s Plastics Div.** and the firm's subsidiaries, **Fryling Electric Products**, Holly Springs, Miss., and **Andover Industries**, Andover, Ohio. He will headquarter at 20050 Livernois Ave., Detroit 21, Mich.

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July 30, 1957

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The Surfacing and Printing Group of the Bakelite Company is very much interested in learning what inks Claremont would recommend for the flexographic and gravure printing of two of its recently developed products.

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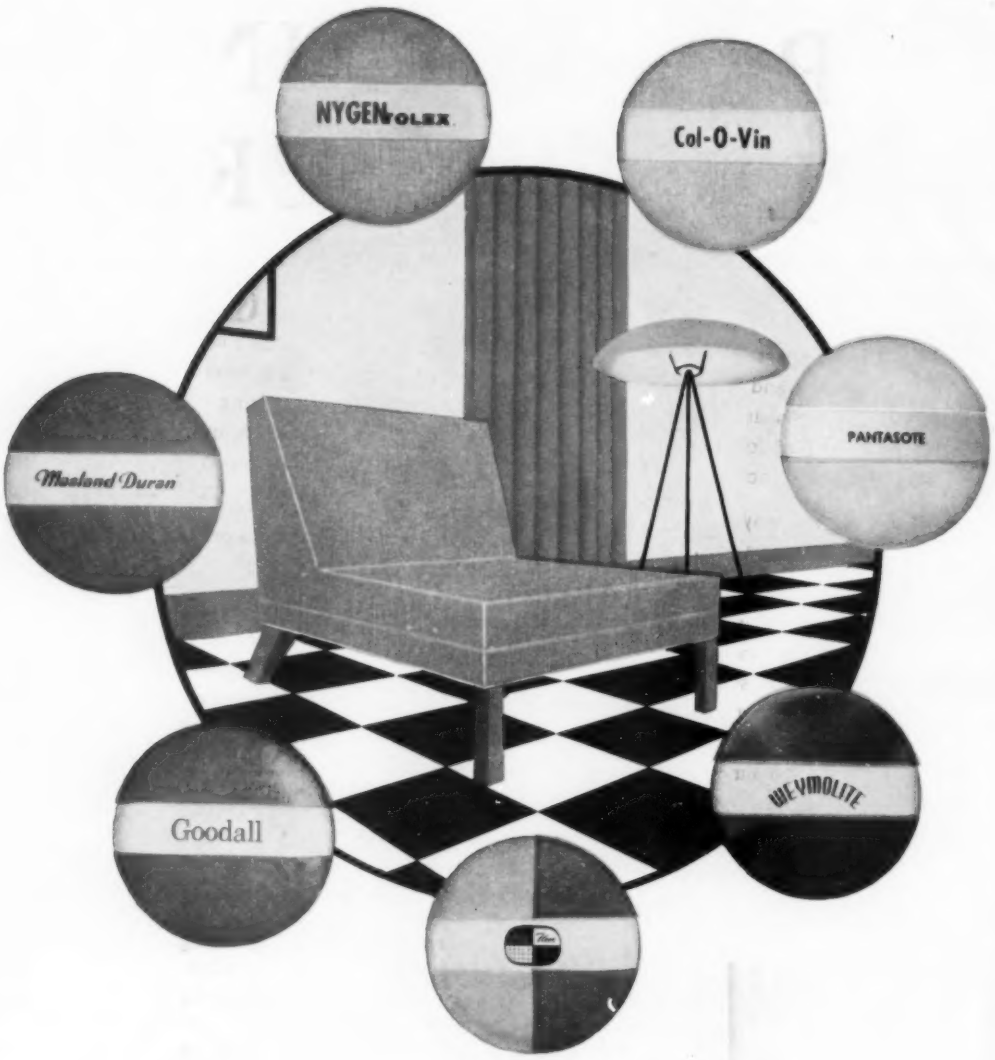
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A big part of the vinyl plastic fabric you see on furniture in today's homes, offices, and stores is made by the famous names at left. These are the coated fabrics that are the most tailorable...the most durable...meeting every standard for style and appearance. They are the highest possible quality because nothing is spared in choosing raw materials to produce them.

That is why leading manufacturers use Emery Plastolein Plasticizers. They want to make sure they have the extra quality that makes fabrics perform so well, for so long.

If *you* are interested in producing high quality sheeting, coated fabrics, film and extrusions, you *too* should use Plastolein Plasticizers in your plasticizer system. The coupon below will bring you all details about the outstanding permanence of Plastolein 9720 Polymeric, the unsurpassed low-temperature performance of Plastolein 9058 DOZ, as well as data on other Emery Plastolein Plasticizers. Mail it today.

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Please send me the 32-page Emeryfacts titled, "Plastolein Plasticizers."

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Firm.....
Address.....
City.....State.....

Classified Advertisements

EMPLOYMENT • BUSINESS OPPORTUNITIES • USED OR RESALE EQUIPMENT

Machinery and equipment for sale

FOR SALE: 1953 Model 16 oz. HPM. Excellent condition. Now running. Available on or before March 15th. Price, photographs, spare parts list available on request. Reply Box 3323, Modern Plastics.

FOR SALE: Wheelabrator 20x27". Injection Presses: Stokes Automatic 4 oz. Jackson-Church 64 oz. HPM 24 to 4 oz. sizes. Reeds: 22, 16, 12, 8 oz. Lester 8, 12 oz. Watson: 48, 28, 12 oz. Lewis 6 & 4 oz. Van Dorn 1 oz. Extruder: 3½" NRM. 30" Sheet Die w. 52" pull-off 36" Brown Vac. form & plug-assist setup. Dulmage 28" Meterpump. Despatch PLHD 6 & 10 draw. Ovens. Cumberland mod. 0 & 10 grinders. 2 HP boilers.—Apex 2 col. Container Imprint mach.—Compression presses various sizes. Elmes Hydrolairpress 30 T. Preformpresses: Stokes 280 G and Defiance 45.—Baker-Perkins 200 gal. mixer. 42 cft. Ribbonmixer. Vacuum Form machines 30x30", 40x60". Dake 200 T. Press.—List your Surplus Equipment with me. Wanted Extruders 1½ to 6" sizes. Defiance 20 Preformpress. All Midwest locations. Justin Zenner, 823 Waveland Ave., Chicago 13, Ill.

FOR SALE: Injection Molding Presses: 2—10D 8 oz Reed's with IMS head; 1—10E 16 oz Reed with 22 oz head; 3—20-28 oz HPM's with Vicker pumps; Alladin Plastics, 5771 W. 96th St., L. A. 45, Calif.

FOR SALE: 1400 Ton Adamson, New '42—Up Act.—34" str., 150"x74" platen, 10 openings. 8-15" dia. rams. 2500 PSI. Like new; 875 Ton Baldwin New '47. 102"x52" platen. 300 Ton Bald. Up Acting. New '51. 66"x105" platen. 30" daylight. 21" str., Self cont'd.; 400 Ton Farrel 4 deck, 48"x48" plat., 18½" str. Steam htd. Eveready—805 Housatonic Ave., Bridgeport, Conn.

JUST SECURED: Most Modern Packaging and Processing Machinery. Equipment installed within last 2 years. Available at great savings. 4—Hayssen Model F Compaks with net weight scales, bulk and dribble feeds. Electric Eyes. 4—Ceco Model 40-9½-GG Automatic Adjustable Cartoning Units. Also Model TT. 1—Pneumatic Scale Automatic Carton Feeder, Bottom Sealer and Top Sealer with interconnecting conveyors. 6—Fitzpatrick Model D-6 Stainless Steel Comminuters. 4—Day size G. 1500 lb. Ribbon type Powder Mixers. 2—Rietz Disintegrators Model RD18 complete with 50 HP motors. 1—Enterprise Foundry Disintegrators Model EVM3 complete with 50 HP motors. Complete Details and Quotations Promptly Submitted. Union Standard Equipment Company, 318-322 Lafayette St., New York 12, N. Y., Phone: Canal 6-5334.

FOR SALE: 350, 200 and 50 ton self-contained compression molding presses; 3 Cumberland 0, ½ granulators, 3 HP; 1 MPM 3½" electrically heated extruder; 2 Stokes R, T preform presses; 1 Cumberland 14" rotary chopper; also mixers, mills, grinders, etc. Chemical & Process Machinery Corp., 52 9th St., Brooklyn 15, N. Y., Phone HY 9-7200.

MACHINERY FOR SALE: 1—Photoelectric one-way cutoff register control GE #CR7505-W111. Never used. Reasonable. Pamarco, Roselle, New Jersey.

FOR SALE: Cumberland #18 Grinder, Cumberland Pelletizer, 5 sets unused B & J. #1 Grinder blades, 2,000 lb. capacity fork lift truck. Reasonable. Machinery can be seen in operation. Blane Corporation, Canton, Mass.

FOR SALE: 12 oz. Watson-Stillman Injection Press. In good condition, complete with instruments. Can be seen in operation. Contact—Harmonic Reed Corporation, 1111 Lancaster Avenue, Rosemont, Penna. Phone—Lawrence 5-4184.

LIQUIDATION SALE: Molding Plant; (2)—375 Ton French Oil Compression Presses. (1)—300 Ton Erie Compression Press. (2)—170 Ton Transfer Presses. (2)—100 Ton Compression. (3)—75 Ton Transfer Presses. (1)—No. 5½ T Colton Preform Machine. (1)—3 DT Colton Tablet Machine. Compressors, Pre-Heaters and miscellaneous shop equipment. Reply Box 3315, Modern Plastics.

FOR SALE: Stokes 150 ton #252 automatic closure molding machine, completely rebuilt and rewired. Good as new. Must be seen to be appreciated. May be observed in operation. Terms, if desired. Principals only. Reply Box 3311, Modern Plastics.

FOR SALE: Stokes 300 ton and Baldwin-Southwark 200 ton semi-automatic Transfer Molding presses. Thermal (La Rose) Preheaters. 2500 ton downstroke 54"x102". 800 ton Laminating Press 26"x38". 300 ton multi-opening 40"x40". French Oil 250 ton 38"x28". Elmes 200 ton 28"x26". Farrel 200 ton 20"x80". 200 ton Hobbing Press. 200 ton 16" Record Presses. D&B 140 ton 36"x36". French Oil 120 ton selfcontained. W.S. 120 ton 24"x24". Also Lab. Presses to 100 tons. Hydraulic Pumps and Accumulators. Van Dorn 1 and 2 ounce Injection Machines. Other sizes to 80 oz. Baker-Perkins and Day jacketed Mixers. Plastic Cutters. Oxford 57" Slitter. Seco 6"x13" and 8"x16" Mills and Calenders. Oil and Elect. Plastic Extruders, lab to 6". Single & Rotary Preform Presses ½" to 4". Partial listing. We buy your surplus machinery. Stein Equipment Co., 107—8th Street, Brooklyn 15, New York.

FOR SALE: 1 Elmes 4 post hyd. press 250 ton cap. dia. Ram 15" Stroke 18", 28"x36" Bed Area. Push backs & knockouts. 2 French Oil Mill 4 post hyd. presses 250 ton cap. dia. of Ram 15" Stroke 18", 28"x 38" Bed Area push backs & knockouts. Subject to prior sale. M. Cooper, 1759 West Grand Ave., Chicago, Illinois.

FOR SALE: Banbury #9 mixer. (3)—4' x 7' Vulcanizers, vertical, ASME 125# WP, quick-opening covers. 1500 HP Farrel horiz. reducer. Sigma blade mixers—2¼, 5, 10, 20, 30, 60, 75, 100, 150 gal., stainless and steel. Perry Equipment Corp., 1429 N. 6th St., Phila. 22, Pa.

FOR SALE: Boilers (Vertical) used, high pressure (160 lb) 3 available, Kane 10 S complete with oil burners (#2 oil); low pressure flame cutoff for low water & water feed pumps; unattended operation. Recently retubed, 220 volt electrical equipment. All in excellent condition. Attractive price. Write Mr. Fradkin; Eagle Plastics Corp., 23-10 Bridge Plaza South, L.I. City 1, N.Y., STillwell 4-9200.

FOR SALE: 1-Baker Perkins size 15USE, 100 gal. all stainless double arm Vacuum Mixer; 1-Baker Perkins size 15VUUM, 100 gal. double arm Mixer, 100 HP motor; 6-Day 250 and 100 gal. double arm Mixers; 1-Ball & Jewell #1 Rotary Cutter; 2-Two Roll Mills 6"x12"; 6-Stokes Model DD2, DS3, D3 and B2 Rotary Preform Presses; 4-Stokes Model "R" single punch Preform presses; 1-Kux Model 15-25 Rotary Preform Press; Also: Sifters, Banbury Mixers, Powder Mixers, etc., partial listing; write for details; we purchase your surplus equipment; Brill Equipment Co., 2407 Third Ave., New York 51, N.Y.

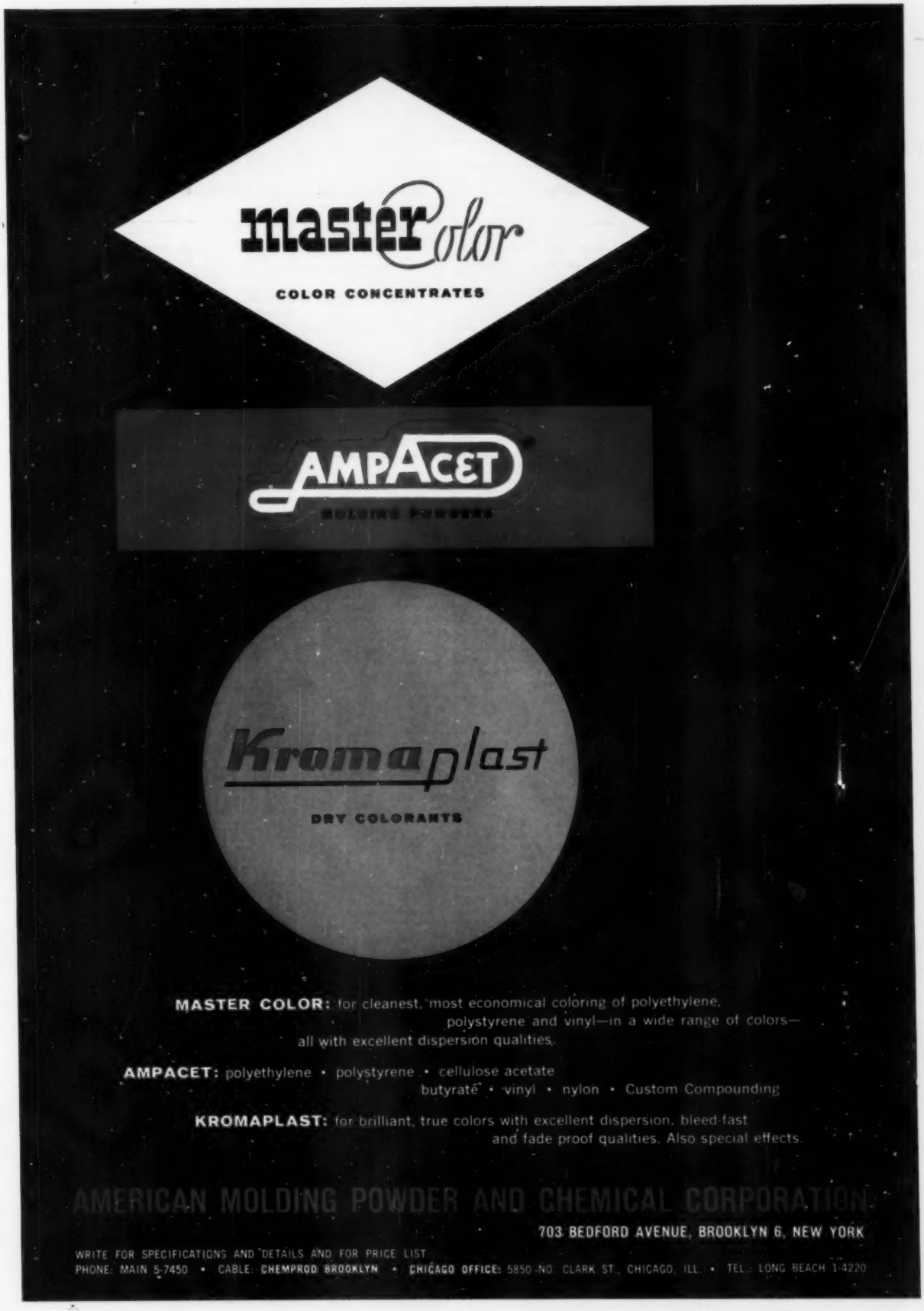
FOR SALE: 64 Oz. Injection Molder with Pre-Plasticizer mold size 32"x50" 750 Ton clamp. Lester 8 oz. Model 2 ½L (1949). DeMattia 12 oz. (1946). DeMattia 4 oz. H.P.M. Rubber Injection molders, 21½" x28" mold space, steam heated platens. Watson-Stillman 300 Ton Semi-Automatic Compression molding Press (1947) self-contained, mold size 34"x27". Watson-Stillman 250 Ton 28"x24". Watson-Stillman 140 Ton 22"x16". Waterbury Farrel 85 Ton 20"x24". W.F. 63 Ton 15"x15". Laboratory Presses—Elmes 20 Ton 8"x8", others 15 Ton 10"x8" and 10 Ton 6"x6" Platens. Scrap Cutters, Valves, Accumulators. Hydraulic Presses—all sizes Aaron Machinery Co. Inc., 45 Crosby St., New York, N.Y. Tel.: WAlker 5-8300.

FOR SALE: Presses—1000 ton Vertical—300-400 ton 36"x36" platens—4 oz. Injection Machine—No. 1 Ball & Jewell Grinder—Carver Laboratory Presses—other Laboratory Presses to 75 ton—6"x13" Laboratory Mills—¾" Solenoid and Cam Operated Valves—Jacketed Heating Kettles. Plastic Machinery Exchange, 426 Essex Ave., Boonton, N.J. Telephone DE 4-1615—cable address Plasmex-Boonton.

GOOD EQUIPMENT: At the right price. Falcon Ribbon Blenders in Steel or Stainless; NRM 2½" Extruder, Rotary Cutters by Ball & Jewell, Sprout-Waldron, Abbe; Baker Perkins heavy duty dbl. arm Mixers, 100, 200, 300 gal; French Oil Mill Hydr. Press 450 Ton; Blaw Knox S/S Resin Kettle 7'6"x7'6", Jktd. Agtd.; Sturtevant 300 cu. ft. Batch Mixer; Stokes and Colton Rotary and Single Pre-form Presses; Send for new First Facts, containing complete illustrated inventory; First Machinery Corp., 209 Tenth St., Bklyn 15, N.Y. Fred R. Firstenberg, Pres.

FOR SALE: 2 oz. Van Dorn, lever type, $1650; (3) 2 oz. aut. molding machines w/accumulator; 4 oz. Lewis, 1954, $3500; 4 oz. Acme, 1953, $5000; 4/6 oz. R-P, 1955; 4 oz. vert. DeMattia; 8 oz. R-P, 1948, $6500; 8 oz. R-P, 1946, $6000; 12 oz. W-S Model E, $6500; 12 oz. DeMattia, toggle, $5000; 12/16 oz. DeMattia, Model M, $16,500; 12 oz. Lester w/solid frame, $5500; 16 oz. & 20 oz. vert. Impcos; 20 oz. R-P w/32 oz. cyl., almost new; 32 oz. R-P w/48 oz. cyl. exceptional; 48 oz. W-S, 1950; Model #246 Vactrim vacuum former; Preplasticizer for 16 oz. H.P.M., 48 oz. cap., almost new, for Model 350 B; tumbling barrels, ovens, grinders, etc. Partial listing—other equipment available. Acme Machinery & Mfg. Co., Inc., 2315 Broadway, New York City, Su 7-1705.

(*Continued on page 262*)


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COLOR CONCENTRATES
AMPACET
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DRY COLORANTS
MASTER COLOR: for cleanest, most economical coloring of polyethylene, polystyrene and vinyl—in a wide range of colors—all with excellent dispersion qualities.
AMPACET: polyethylene • polystyrene • cellulose acetate butyrate • vinyl • nylon • Custom Compounding
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(Continued from page 260)

PLASTICS MACHINERY

Cutters, Rotary, Plastic

Lab & Small Cutters, ⅛ HP to 5 HP
Ball & Jewell #1 with 10 HP MD
Ball & Jewell #2 Motor Driven, Extra Knives

Extruders

MPM 1½" Cross Head Elec Htd Barrel
MPM 2½" Cross Head Elec Htd Barrel
Hartig 3¼" Elec. Htd. 50" barrel, vari-speed drive
Hartig 4½" Elec. Htd. 96" barrel, 40 HP. U.S. Vari-Drive
Stokes—Windsor Model RC-100 Twin Screw 10 HP Vari-Speed Drive

Injection Molding Machines

2 Oz. Van Dorn, Oversize Cylinder, Model H-200
2½ Oz. Van Dorn, Semi Automatic Nylon Cylinder
8 Oz Reed-Prentice, 20 HP Motor Drive
12 Oz. HPM Model H-300-12
16 Oz. Reed-Prentice No. 10-E-16, Elec. Htd., 1948

Mills, Rubber/Plastic

JMC 6" x 13" Cab Mill (New)
18" x 50" Farrel, Rubber/Plastic, 75 HP MD
20 x 22 x 60 Adamson 125 HP Motor & reducer, floor level

Presses, Molding

15 Ton Baker Fully Automatic
15 Ton Stokes No. 200 D-2 Automatic (10)
40 Ton Francis, 4 Opening, 12" x 12" Elec. Heated Platens
50 Ton Stokes, Semi-Auto., Self Cont.
60 Ton Baldwin-Southwark, 7" Ram x 18" Stroke, 26" x 26" Platen
75 Ton Watson-Stillman Fully Automatic, 20" x 20" Platen 5 HP MD
75 Ton French Oil Mill 8" Ram x 8" Stroke, 18" R-L x 17" F-B. Both up and down moving
95 Ton French Oil Mill, 9" Ram x 12" Stroke, 29" R-L x 18" F-B, 3" Pull Backs
100 Ton Stokes Standard Semi-Automatic, Power System, Timing Controls
100 Ton Lake Erie Hi-Speed, 24" x 24" Bed, 12" DLO, Self Cont.
113 Ton French Oil Mill, 6 Opening, Elec. Htd. Platens 15" x 18"
113 Ton R.D. Wood, 5-Opening Elec. Htd. Platens 14" x 20"
175 Ton Viceroy Slab-Side 24" x 24", Elec. Htd. Platen with Hand Pump
200 Ton Stokes Semi-Automatic, Power System, Timing Controls
225 Ton Farrel 14" Ram x 18" Stroke, L-R 26½" x F-B. 24½" 7½ HP MD
300 Ton Stokes Semi-Automatic, Power System, Timing Controls
300 Ton Dunning & Boschert 30" x 30" Platen
314 Ton Lake Erie 36" x 36" Semi-Automatic, Push Button Controls 10 HP Pump & Motor
625 Ton Farrel, Steam Platens 52" x 52", Pump, Mfr., Controls, Under Power
700 Ton Dunning & Boschert 24" Ram 50" x 33" Bed
1250 Ton Farrel Two 23" Rams 80" x 48" Bed

Furnaces and Ovens

Megatherm, 3/60/220, 3 KW, 2-3 lb. Phenolic Per Min. (8)
Despatch Mdl. P1hd-8 8 Drawers, 12 x 18 x 2½" (2)

Tablet Machines

Model "E" Stokes, Complete with MD
Model R. Stokes, Single Punch, Variable Speed Motor Drive, 3 HP
Model 45 Defiance, 200 Ton, 15 HP, Vari-Speed, MD
Model F, Stokes, Single Punch, MD
No. 5 Arthur Colton, Motor Drive, 3 HP
No. DDS-2 Stokes, 23 Stations, US Vari-Drive, 10 HP
Model T Stokes Hydraulic Equalizer, MD
Model 280-G Stokes Preform Press. 100 Ton Dual Pressure—Late

Mixers

No. 3A Banbury, 150 HP Md Rubber/Plastic

Calenders

6" x 16" Thropp, 3 Roll Chrome Plated, 7½ HP Vari-Speed
9" x 48" American Tool 4 Roll Doubling, Belt Drive
6" x 13" Elec. Htd. 6 Roll Lab Type, 7½ HP MD

Pelletizers

Mitts & Merrill Model 10-N-6 15 HP V.S. Drive

Make Us Your Prime Source for All Types of Plastics Machinery

Hydraulic Presses from lab size to 5,000 ton
Injection Molders from ⅛ oz. to 60 oz. size
Extruders from lab size to 12"
Plastic & Rubber Mills and Calenders up to 84" size
Tablet Preform Presses, single punch and rotary, all sizes
Mixers all sizes, types and capacities
Also a complete selection of tumbling barrels, take-up equipment, hydraulic power units, pumps, ovens, blenders, scrap cutters, pelletizers, coating equipment and laminating equipment.

JOHNSON MACHINERY Co.
683-P Frelinghuysen Ave., Newark, N.J.
What Do You Need? What Have You To Sell?

FOR SALE: (6) 100 ton, 10" ram, 10" stroke @ $1250; (7) 200 ton, 9" stroke, 14" ram, 36x36, @ $2160; (6) 200 ton, 9" stroke, 15" ram, 30x30 @ $1850; (1) ton complete, 18x18 @ $1850 (1) 200 ton 16" ram, 30x30 @ $2450; (2) 200 ton 16" ram, 42x42 @ $2850; (1) 200 ton, 15" ram, 42x42 @ $2600; (3) 250 ton (2) 12" ram, 30x60 rebuilt @ $3675. Hydraulic Sal-Press Co., Inc., 386-90 Warren Street, Bklyn, N.Y.

Machinery wanted

PREFORMER WANTED: Used but in good condition. Must be a Logan or Bipel. Write giving condition, age and price. Reply Box 3302, Modern Plastics.

PLASTIC DRYING OVEN: Electrically heated, capacity 24 to 40 trays. Reply Box 3319, Modern Plastics.

WANTED: Used Rotational Molding Machine. Akron Presform Mold Company Single Spindle Plastisol Rotational Molding Machine adjustable from 2 to 15 RPM spindle speed. Suitable for development work. Reply Box 3314, Modern Plastics.

EXTRUSION MACHINE: Extrusion machine, 2" x 2½", all stainless lined capable of handling saran. Give full particulars with reply. Box 3318, Modern Plastics.

Materials for sale

FOR SALE: 20,000 lbs natural Polyethylene pellets, 10,000 lbs hi gloss jet black acetate, 3,000 lbs clean 1st regr. natural Zytel 101, 5,000 lbs virgin lt. blue hi impact Styrene, 8,000 lbs 1st regr. white hi impact Styrene, 12,000 lbs regr. clear acetate light gauge, 9,000 lbs regr. mix color Butyrate. 10,000 lbs regr. mix color Styrene. Many other materials available at low, low prices. Reply Box 3325, Modern Plastics.

FOR SALE: Styrene, hi-impact, large quantities reground available. White, light blue, light green, pink, etc. Low prices. Write, wire or phone, Success Plastics Corp., P. O. Box 506, Indpls., Ind. Liberty 6-2919.

MATERIALS FOR SALE: 100,000 lbs black general purpose medium flow phenolic molding compound. 40,000 lbs black flock-filled medium impact phenolic molding compound. 20,000 lbs glass filled phenolic molding compound. 50,000 lbs pulverized phenolic woodwaste resin. Chicago Area, make offer to Reply Box 3308, Modern Plastics.

Materials wanted

WANTED:
Plastics Scrap and Rejects of all kinds. Ground and unground. Also rejected molded pieces and surplus virgin molding powders. Top prices paid. Reply Box 3306, Modern Plastics.

WANTED: Supplies of Mother-Of-Pearl Sheets for the use of making buttons and PVC waste to be reclaimed. Please write to, Walter Trading Co., 319 Marina House, Hong Kong.

WANTED: Plastic of all kinds—virgin, reground, lumps sheet and reject parts. Highest prices paid for styrene, polyethylene, acetate, nylon, vinyl etc. We can also supply virgin & reground materials at tremendous savings. Address your inquiries to: Gold-Mark Plastic Compounds, Inc., 4-05 26th Ave., Long Island City 2, N. Y., RAvenswood 1-0880.

URGENTLY NEEDED: Acrylic Scrap: In any form. Contact us for our latest quotations. Claude P. Bamberger, Inc., One Mount Vernon Street, Ridgefield Park, N.J. Telephone: HUbbard 9-5330.

MOLDERS: We can use any clean reground Polystrene. High impact—Acetate and Butyrate—also light mottled material. Vacuum sheet stock also acceptable. Submit samples and price wanted. Contact: Brown & Shipley Corporation, 963 Newark Ave., Elizabeth, N.J.

PLASTIC SCRAP: Get top money—Now paying top prices for all thermoplastic scrap. Wanted: polystrene, cellulose acetate, vinyl, polyethylene, butyrate, acrylic, nylon. All types and forms including rejects and obsolete molding powders. Fast action wherever you are located. Write, wire today. Gering Products, Inc., Kenilworth, N.J.—New Jersey. Bridge 6-2900—New York: Cortland 7-3583.

PLASTIC SCRAP WANTED: From molders, vacuum formers, fabricators; acrylic, styrene, polyethylene, acetate, butyrate, etc. For top prices write, wire, phone collect Philip Shuman & Sons, 15-33 Goethe St., Buffalo 6, N.Y. Tel: HUmboldt 1811.

Molds for sale

FOR SALE: Houseware molds, comb molds, also some novelty and specialty items. All in excellent condition. No reasonable offer refused. Send for list. Reply Box 3313, Modern Plastics.

Help wanted

EXTRUSION FOREMAN: Opportunity to build up extrusion department as a new department in a large company. Captive market. Must have experience with all extrudable plastics, including saran. Capable of designing dyes. Product mainly thin wall tubing. Replies confidential. Reply fully, stating detailed experience and salary requirements. Reply Box 3317, Modern Plastics.

MOLD DESIGNER: Experienced to serve in supervisory capacity. Must be capable of estimating cost of tool and plastic parts. Excellent opportunity to qualified person. State full qualifications first letter to Niagara Insul Bake Specialty Company, Albany, New York, P.O. Box No. 9037.

WORKING PRODUCTION MANAGER, EXPERIENCED: for reinforced transparent fiberglas panel manufacturer on East Coast, with ideal working equipment and personnel. Salary open. Unusual opportunity for right man with firm that is rising fast. Reply Box 3322, Modern Plastics.

MANUFACTURERS REPRESENTATIVES WANTED: Custom molder (injection and vacuum forming) wants representation all areas. Straight commission, protected territories. North Star Industries, Inc., Hopkins, Minnesota.

REPRESENTATIVE WANTED: Calling on industrial accounts, to handle line on plastic packaging products, custom extrusions, and vacuum foam parts. Complete modern facilities using all type plastic materials. Commission basis. Reply Box 3320, Modern Plastics.

EXTRUDER OPERATOR: To be responsible for complete operation of sheet extrusion equipment. Knowledge of general shop and vacuum forming operations desirable. Reply stating education, age, experience and starting wages. Dart Mfg. Co., Mason, Michigan.

REINFORCED PLASTICS SALES ENGINEER: National raw materials company needs aggressive sales engineers to cover California, Wisconsin, Illinois, Indiana and New England. This program includes commission selling of all types of reinforcing materials to all segments of this industry. Send complete resume including experience. Replies will be held in strict confidence. Reply Box 3301, Modern Plastics.

(Continued on page 265)

IMS PURE
SILICONE FLUID
MOLD RELEASE SPRAY

EXCLUSIVE, FAST,
ALL-METAL VALVE
ENDS FUMBLING
SAVES CYCLE TIME
Keeps Mold Lube
Cost Down
It Isn't Size —
It's Performance
and Quality
That Count!



PRICES (Delivered)
Sample Can $2.00
Per Unbroken Dozen $18.00
Per Unbroken Gross $197.40

The Economical Way to Buy and Apply Pure, Costly Silicone Fluid!

To Cover All Molding Conditions
Keep Both Types on Hand

IMS PURE
ZINC STEARATE
DRY POWDER SPRAY

HANDY MOLD DUSTER
Quick—Convenient
Removable, Cleanable Spray Head Directs Dust Into Cavity Without Waste.



PRICES (FOB Cleveland)
Sample Can $2.00
Per Unbroken Dozen $13.80
Per Unbroken Gross $144.00

IMS Mold Releases are designed to bring you maximum quality and performance. Our Silicone Fluid Spray utilizes only more costly volatile Freon to minimize part marking on fast cycles. The Dry Powder Spray should be used in all applications where painting or plating follows the molding operation, also in preforming.

INJECTION MOLDERS SUPPLY CO.
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The Cambridge Fabric Permeameter is an accurate, rugged and convenient instrument of the production testing and quality control of proofed fabrics and sheet plastics which must contain or exclude gases, such as Hydrogen, Helium, Carbon Dioxide, etc.

The rate of permeation is quickly determined by equipment utilizing the thermal conductivity method of gas analysis and is indicated in terms of liters per square meter per 24 hours of gas.

Manufacturers of proofed materials of low permeability for lighter-than-air craft, life rafts, life jackets, gas masks, etc., will find this an indispensable instrument.

Write for particulars
CAMBRIDGE INSTRUMENT COMPANY, INC.
3533 Grand Central Terminal, New York 17, N. Y.
FOR SHEET PLASTICS

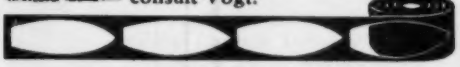
VOGT PLASTIC
EXTRUSIONS



We Don't Pull Rabbits Out of Hats
. . . But We Do Help Produce 'Em!

Yes, our vinyl and polyethylene extruded tapes are used to punch out ears, feet and many other parts for a wide variety of toys. Available in any color, width and thickness. Parts made from such tapes cost less than if made from wide sheets.

Whether you require tubings, rods, bindings, weltings, or special shapes, it will pay you to consult Vogt.



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MAKERS OF VOPLEX® PRODUCTS
including NALGON tubing

Design for **LOWER MANUFACTURING COSTS**

...with molded reinforced polyester

Assembly time is cut to the bone and machining is eliminated when you design with ATLAC Thermaflow molding compounds in mind. Complex multi-piece assemblies can often be molded in one rigid piece, complete with molded-in bushings and fittings. Machining is made unnecessary by precision molding techniques and excellent surface finish. Surfaces need no painting—the part is corrosion resistant and available in colors.

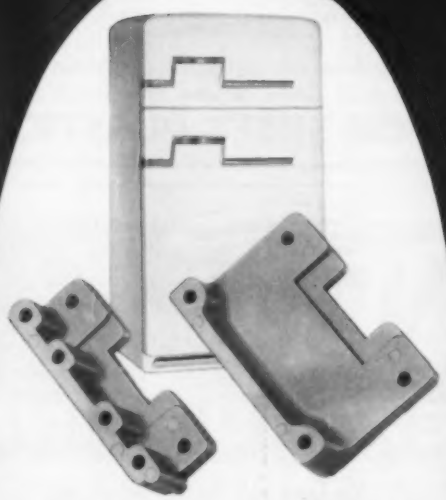
In addition, ATLAC Thermaflow materials offer:

- **Weight savings: specific gravity 1.8**
- **High impact and flexural strength**
- **Superior corrosion resistance**
- **Excellent electrical insulation and arc tracking resistance**

To the molder—

ATLAC Thermaflow materials are easy to mold in large shapes, with deep draw and intricate detail. Reinforcement flows evenly throughout the piece . . . no weak spots at corners or edges. Compression or transfer mold them on standard presses, at temperatures from 275-350°F., and pressures from 500 psi and up. Curing time is relatively short.

A wide range of glass fiber and nylon rag reinforced grades is available. Write today for literature on materials, molding recommendations and applications.



SIMPLER ASSEMBLY FOR Servel

Bracket and support for refrigerator liner and evaporator, molded of ATLAC Thermaflow compound, replace (1) multiple-piece assembly of steel part, spacer and fasteners and (2) machined piece of laminate. Gave superior thermal insulation, better shock resistance, simplified manufacture. Molded for Servel, Inc. by Kurz-Kasch, Inc., Dayton, Ohio.

ATLAC THERMAFLOW

ATLAS

ATLAS POWDER COMPANY
Chemicals Division
Wilmington 99, Delaware

(*Continued from page 262*)

SALES REPRESENTATIVES WANTED: Expanding central Michigan plastics firm seeks qualified sales agents in several areas. Now supplying Big 3 with thermoformed embossed sheet plastic parts and assemblies for interior trim. Require agents calling on OEM accounts, who have good vision, and can find productive applications for our services. Ours is potentially a $20,000 per year account, and we want to appoint only top agents. Contract arrangement, straight commission. Please reply, giving short personal history, and outlining territory and trade covered, years established, and bank and trade references. Convenient interviews will be arranged. Reply Box 3316, Modern Plastics.

POLYVINYL CHLORIDE: New Technical Service Department: Opportunities for Technical Servicemen with B.S. or M.S. degrees in Chemistry or Engineering, and 3 to 10 years experience in compounding or processing in the vinyl calendering, extrusion, or electrical applications fields. Research center located on Lake Erie, 30 miles east of Cleveland, Ohio. You are invited to submit a resume of your qualifications. All inquiries will be given confidential and prompt consideration. William L. Abele, Recruiting Department, Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

SALES REPRESENTATIVE: Wanted for eastern U.S. to handle the sales of Vinyl Plastisols, Organosols and solution coatings. Technical background required as well as selling experience. Address replies to Auburn Plastics, Inc., Chemical Processing Division, Auburn, New York.

DEVELOPMENT MAN: Progressive development minded calender sheeting manufacturer is interested in high caliber man to head up group of four development men. Should have some experience in calendering, decorating, embossing vinyl sheeting plus experience and contacts for other than vinyl products like polyethylene, rubber resin blends, etc. Reply Box 3326, Modern Plastics.

POLYETHYLENE SHEET SALESMAN: Polyethylene sheet manufacturer wants to develop new applications, for packaging housewares, etc. Needs man who can bring large customer ideas through prototype and into production stage. Will consider either technical or idea man with good customer approach. Reply Box 3327, Modern Plastics.

FACTORY MANAGER: Experience or adaptability to plastic products preferred; industrial engineering background. For "shirt-sleeve" supervision of all internal factory operations, planning, time-study, methods, incentives, etc. The company is one of the foremost in its industry; the location, a pleasant suburban town near Memphis, Tenn. If you are self confident and practical, this is a challenging opportunity for you, with attractive starting salary and growth potential. Our staff knows of this advertisement. Please send complete resume which will be treated in strict confidence. Reply Box 3310, Modern Plastics.

SALES ENGINEER WANTED: capable of estimating, designing, and laying out custom-injection molds for well-established eastern concern. Own tool room and 14 injection machines. Excellent opportunity for advancement with growing business. Capable of providing technical consulting services to our customers. Give complete resume of experience, ability, past earnings and education. All replies will be handled in strict confidence. Top salary commensurate with experience and ability. Reply Box 3304, Modern Plastics.

MANUFACTURERS REPRESENTATIVE: Glass Fiber Manufacturer seeking experienced sales representative with contacts in the reinforced plastics field. To handle line of reinforcing, surfacing and decorative fiber. Several territories open. Reply Box 3303, Modern Plastics.

WANTED: a man with good experience in the technical and selling aspects of vinyl extrusion. Salary and bonus commensurate with ability. Reply Box 3305, Modern Plastics.

MANUFACTURER'S REPRESENTATIVES: Plastic fabrication, vacuum forming and skin packaging. Progressive Mid-West company. A few choice territories still open. Straight commission, protected territories. Send complete resume. Winton Mfg. Co., 5001 N. Wolcott Ave., Chicago 40, Illinois.

GRADUATE CHEMIST: Experienced in the field of coating organisols and plastisols; Salary commensurate with experience. Reply Box 3300, Modern Plastics.

CHEMICAL SALES: Unusual sales, technical service and market development opportunity for chemist having good grasp of polymer technology and isocyanate chemistry initially to assist, later to manage all aspects of broadening sales of isocyanates. Company is a progressive growing manufacturer of increasing range of organic chemicals. E. D. Walen, The Carwin Company, North Haven, Connecticut.

GENERAL FOREMAN: Finishing Department. Established Chicago area injection molder has immediate opening for top man in finishing department. Must be good organizer and capable of handling people. Unusual opportunity for growth with company that is expanding. Stock option and bonus plan. Reply in confidence giving experience and salary history. Reply Box 3307, Modern Plastics.

PERSONNEL: Executive—Technical—Sales—Production. Employers and Applicants—whatever your requirements, choose the Leader in Personnel Placement. Cadillac Associates, Inc., Clem Easly—Consultant to Plastics Industry, 220 South State, Chicago 4, Ill. —WAbash 2-4800. Call, write or wire—in confidence.

SALESMAN: Material Supplier needs salesman 25-30 years of age with compression molding experience. Must have sales personality. Locate within 50 miles New York. Reply Box 3309, Modern Plastics.

MOLD DESIGN ENGINEER: Excellent opportunity for right man with mold design and quotation experience in growing mold shop of 14 men in Philadelphia area. Must invest some capital to become part of business. Our expansion is held up by need of this man. Full particulars and salary held in strict confidence. Reply Box 3328, Modern Plastics.

ASSISTANT PLANT SUPERINTENDENT: Chicago area corporation has an exceptionally fine position for a man with sheet extrusion and vacuum forming experience. This position is for a man qualified to handle production and personnel. Excellent opportunity for advancement. Salary commensurate with experience and ability. Inquiries treated confidentially. Reply Box 3332, Modern Plastics.

NEW DIVISION: of well established company seeking salesmen to sell virgin and reclaimed compounds to all trades. Reply Box 3330, Modern Plastics.

ENGINEER: For industrial paper and film converting company located in new plant in suburbs of midwestern city. Permanent position with a reliable growing concern. You will be in complete charge of machine design, building and maintenance. Diversification of product line insures interesting and challenging work. Good salary, profit sharing bonus and pension plan and stock purchase plan. Please send resume of your experience, education and personal history to Box 3324, Modern Plastics.

ENGINEERS PARADISE: For young, versatile engineer with 6-10 years practical experience in machine design and construction. Must have had personal mechanical work experience. We do not want a "paper" man. We require this man for a challenging position where fast action and frequen' changes are required. Should be able to work out and develop ideas into manufacturing processes, be able to work on his own and "get things done." Excellent opportunity for right man to work himself into top position. We are an old, established but versatile plastics company in the custom fabricating field in the metropolitan NY area. If you qualify, or if you know of someone who is looking for this singular opportunity to progress; Reply Box 3329, Modern Plastics.

REPRESENTATIVE: For Eastern Seaboard, semi retired, thoroughly familiar with rubber & plastic mchnry. Full or part time. Strictly substantial commission basis. Prefer man w/investment capital. Est. firm now in similar line. Reply Box 3331, Modern Plastics.

THERMOFORMING: Unusual opportunity for mature, experienced Sales Engineer with rapidly expanding company offering the world's outstanding line of thermoforming machinery. If you know this field, are enthusiastic for its future and feel stymied in your present position we would like to talk to you about our program for thermoforming machines in packaging and industrial applications. Hdqtrs. N.Y.C. Write complete background. Reply Box 3333, Modern Plastics.

Situations wanted

PLASTICS ENGINEER: Young man with 5 years experience in customer contact and trouble shooting work in the field of thermosetting molding compounds. Graduate Electrical Engineer. Family. Desires more responsible position in sales, production, or technical service. Will relocate. Reply Box 3312, Modern Plastics.

Miscellaneous

FOR SALE: Injection molding plant in Havana, Cuba producing toys and housewares. Opportunity for someone interested in acquiring a going business. Price and terms attractive. Reply Box 3321, Modern Plastics.

PROPOSITIONS INVITED: Progressive firm in Great Britain specializing and prominent in the manufacture of granulated aluminium has over 75,000 square feet of modern factory space, and over three acres of ground for further development available; situated in Scotland near Ports. Would like to enter the plastics field and would consider any manufacturing or marketing proposition for U.K., Commonwealth, and Continent, in cooperation with American concern. Correspondence in strictest confidence to Mr. H. Klein, Managing Director, Oakland Metal Co. Ltd., 142, New Bond Street, London W.1.

WANTED: New or unusual toys, housewares items which we can manufacture and/or distribute. North Star Industries, Inc. Hopkins, Minnesota.

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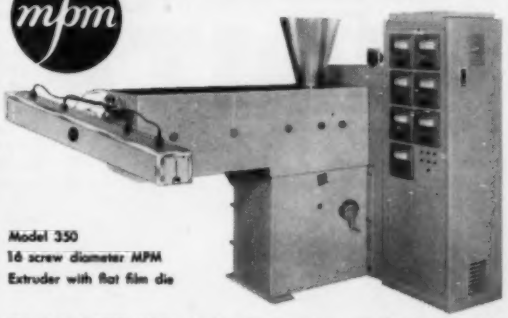
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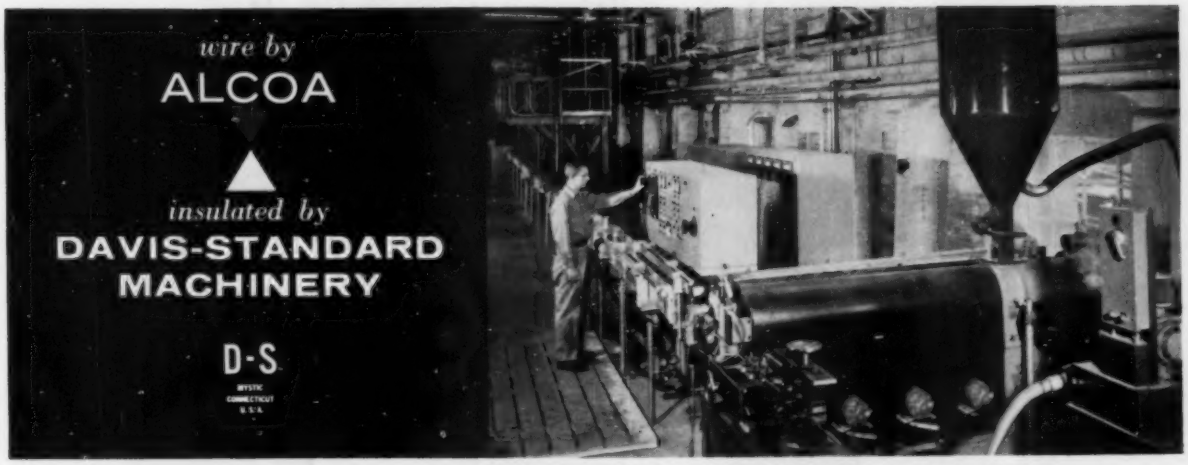
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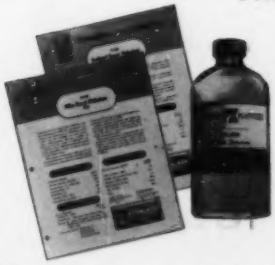
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